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VOL. XXV

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D. M. Campbell, Editor A. T. Kinsley, Associate Editor

There is no authentic record of any milk borne epidemic caused by properly pasteurized milk.—Milton J. Rosenau.

If there were no other reason for milk pasteurization, it would appear to be folly to drink raw milk containing the abortus organism.—Alice C. Evans.

Milk is the nearest approach to a perfect food that we possess. It would be most unfortunate if the misinformation in lay literature should result in a decrease in the use of milk.—Morris Fishbein.

Rash indeed would be the Health officer who would give any raw milk a safe bill of health, for raw milk is likely to be infected by carriers, missed cases or other unseen means. Furthermore, infection in milk does not disclose its presence by our available tests.—Milton J. Rosenau.

There are many milk borne diseases other than undulant fever that are avoided by pasteurization. The establishment of evidence of the etiologic unity of contagious abortion of cattle and other domestic animals and undulant fever in human beings is but one addition to many valid reasons for this safeguard.—Morris Fishbein.

Tuberculosis of the avian type costs Iowa swine raisers 10c per hog on 10,000,000 hogs annually.

Culling is of value in handling tuberculosis of poultry, but can not be depended upon to remove all or even a major part of infected fowls.

Testing poultry for tuberculosis is too big a task to be undertaken and furthermore, it would not be successful in ridding poultry of the disease even if it could be carried out, because it would not eliminate environmental infection.

The elimination of tuberculosis from poultry flocks depends upon three things, all of which are economically profitable irrespective of tuberculosis: (1) artificial incubation; (2) rearing on clean ground; (3) marketing the birds at not more than one year of age.

Of every 1,000 pounds of poultry, one year of age or over, slaughtered at a midwestern packing house having government inspection, 82 pounds are condemned. Of spring chickens, 3.2 pounds of each 1,000 pounds are condemned. The average condemnation of all poultry packed at this plant is 24 pounds per thousand pounds. The condemnation for tuberculosis averages 20 pounds per thousand, or 80% of the total condemnation.

In tuberculosis control work, durability of public confidence and support will depend ultimately on actual cost and actual results, not on apparent results or on propaganda.—Reynolds.

One lesson taught by the postmortem examination of poultry at packing plants is that poultry should be marketed at the age of not more than one year. It has been estimated that not one flock in ten, pays for its keep after the first year. The egg production during the first production year is 30 to 50% greater than during succeeding production years.

Although knowledge concerning animal disease is comprehensive, recent observations have revealed several comparatively new maladies—or those newly recognized as of economic importance. One of these, anaplasmosis, is caused by a protozoan parasite in the blood, and results in loss of appetite, fever, and other symptoms common to febrile diseases. Anaplasmosis has been reported as existing in Kansas, Florida, Louisiana, Arizona, Texas, Oklahoma, Missouri, Nevada, and California. Investigations are in progress to determine how the disease is communicated. When determined this should point the way to methods for control.—J. R. Mohler.

Hemorrhagic septicemia occurs chiefly among animals which have been subjected to hardships of travel, especially in the winter months. The disease may be prevented by immunization with bacterins or aggressin injected at least 10 days before shipping the animals. Other methods of reducing losses from shipping fever include regular and adequate feeding and watering, plenty of rest, and general attention to the comfort of animals en route to prevent drains on their vitality. The infection is prevalent throughout the country, but animals in vigorous, thrifty condition are least likely to be victims of the disease.—J. R. Mohler.

Hemorrhagic septicemia may occur in shipped-in feeding lambs within two weeks after shipping, but is not common after that time.—Newsom.

More than one-half of the pig crop is lost every year in Oklahoma according to C. P. Thompson, swine husbandman of the A. & M. College at Stillwater. These losses are largely attributed to inadequate facilities and improper care at the time of farrowing.

During 1926, 46 cases of undulant fever were reported in this country. During 1927, 217 cases; during 1928, 649 cases; during 1929, 1301 cases. There is abundant evidence to indicate that the majority of cases of undulant fever are passing unrecognized. —Morris Fishbein.

Cryptorchidism is relatively prevalent in Angora goats. This condition is usually due to inheritance, however some cases are apparently not inherited. The percentage of cryptorchids in a flock in which ridgling bucks were used was over 35% and in flocks where there were no cryptorchid sires, less than 0.6%.—Bul. No. 407, Texas Agr. Exp. Sta.

"The thrift, daily gains, and feed required to make 100 pounds of gain were practically the same when pigs were fed on the ground as when they were fed on a concrete feeding floor, indicating that if a bit of caution is exercised in scattering the corn, a concrete feeding floor is not necessary for summer feeding of pigs under average Kansas conditions."—Circular 112, Kansas Agricultural Experiment Station. No doubt the foregoing quotation is correct, but will the requisites provided be executed even on Kansas farms? If the hog lots and feeding beds are changed frequently, no doubt the method of feeding advised will be successful, but the expense of a concrete feeding floor is negligible in comparison to the loss of feed and parasitic disorders that are incident to the usual "ground feeding."

Fowl Cholera is prone to occur and is more fatal in fowls that are overfed. It is advisable to destroy birds affected with cholera but they should not be destroyed by chopping of the head for the B. aviseptica occurs in the blood and this method of destruction would spread the infection.

Single injection of prophylactic rabies vaccine is effective in protecting dogs against infection from the same strain of virus that was used in the production of the vaccine. However, it has been found that there are different strains of rabies virus in the United States and a vaccine may not protect in all cases.—*Exp. Sta. Rec.*

One chick infected with the B. pullorum may infect all the chicks of a hatch and contaminate the incubator and brooder and thus infect future hatches. White diarrhea in chicks is practically incurable and those showing the affection should be destroyed and burned and the surroundings thoroughly cleaned and disinfected.

The approximate incubation periods for eggs of the following birds are:

Hen	21 days
Peafowl	28 days
Duck	28 days
Goose	30 days
Guinea	25 days
Pigeon	18 days
Pheasant	25 days

Poultry diseases have received increasing study in recent years, the result primarily of the growing commercial importance of the poultry industry and of the enhanced values of individual birds. Though poultry diseases are numerous and widespread, those of principal economic significance are pullorum disease (bacillary white diarrhea), infectious bronchitis, tuberculosis, blackhead (of turkeys), roup, and coccidiosis. Research is improving methods of preventing and controlling poultry maladies, especially through blood tests, vaccination, and sanitation.—J. R. Mohler.

Cases of undulant fever were recorded by the Health Departments of every state in the union in 1929.

In any discussion of animal and human health problems, it is well to consider that the work which the veterinary profession and the livestock sanitary authorities are doing to control and wipe out animal diseases, is also of service to mankind in ways other than merely checking communicable diseases.

The livestock industry supplies man not only with food, clothing, leather, and many other necessities of life, but it also serves man in scores of other ways. It yields fertilizer to maintain the fruitfulness of our fields, gardens, and orchards and contributes many products and by-products to our arts and industries. Certain of the glands of animals yield many valuable substances used in human medicine, pepsin, insulin, and adrenalin among them. Not only is there close relationship between animal diseases and human health, but the study of livestock problems and sciences dealing with animal diseases contributes in a surprising degree to human health and welfare.—J. R. Mohler.

SANTONIN, CALOMEL AND ARECA NUT FOR WORMS IN COLTS

Commenting on the article on "Diseases Incident to Breeding Horses" in the May issue of VETERINARY MEDICINE, Doctor Dimock says that the anthelmintic treatment given in the last line of the article, is not as complete as it should be, stating:

"For round worms in suckling colts, I usually use santonin, calomel and areca nut. This preparation is used because it is fairly efficient, harmless and comparatively easy to administer. After the colt is weaned, and in some cases shortly before weaning, we treat for intestinal parasites as follows: Carbon disulphid for bots and ascarids; oil of chenopodium, turpentine and raw linseed oil for strongyles and other closely related parasites of the large intestine. Both preparations are given through a stomach tube."

Infectious Necrotic Enteritis of Swine

By A. T. KINSLEY, Kansas City, Missouri

INFECTIOUS necrotic enteritis designates a diseased condition in swine due to infection with the *Bacillus suipestifer*. It is manifested by inflammation of varying intensity and extent, primarily involving the mucosa of the large intestine. Although this disease has been recognized for years it was not differentiated from hog cholera until 1907. There has been some confusion relative to this malady because of the different names applied. Thus, the condition has been designated, intestinal necrobacillosis, pig typhoid, bacillary hog cholera, swine typhus, etc. Although there are some objections to the name "Infectious necrotic enteritis" it is more applicable than any other and has been quite generally accepted.

Occurrence

Pigs weighing 30 to 50 pounds are most frequently affected with infectious necrotic enteritis, although it may occur in recently farrowed pigs and in aged hogs. Breed appears to play no part as regards susceptibility to this disease. The condition of the swine undoubtedly is a factor in susceptibility; however, shoats in the best of condition become affected. Climatic conditions have little or no influence on the prevalence of infectious necrotic enteritis, although the disease appears to be more common in late spring and early autumn, probably because that is the season when the majority of the pig crop is at the most susceptible age. Sanitary conditions in which the swine are maintained have an influence upon the susceptibility of swine to the infection; however, the disease may prevail in swine that are kept in clean sanitary quarters. Food seems to have little, if any, influence upon the prevalence of the disease, although insufficient or poor quality of feed no doubt predisposes to this disease, as it does other diseases.

* Read before the Eighth Annual Conference of Kansas Veterinarians, held at the State Agricultural College, Manhattan, Kansas, February 6 and 7, 1929.

Importance

The importance of *B. suipestifer* infection is not fully realized by swine breeders and feeders and some veterinarians do not appreciate its seriousness. It is very probable that the economic loss incident to the *B. suipestifer* is as large as the loss due to cholera. It is further evident that the infection is becoming not only more widespread but also is becoming more virulent.

A large percentage of the losses of swine from one to three weeks after vaccinating with anti-hog cholera serum and virus is due to *B. suipestifer* infection. Unfortunately, these post vaccination losses are tending to discourage vaccination against cholera.

Etiology

The *B. suipestifer* has been demonstrated beyond any reasonable doubt to be the primary causative factor of infectious necrotic enteritis. Many other microbian invaders occur in the affected tissues of infected swine and are probably of some importance. The *Actinomyces necrophorus* occurs quite regularly in the deeper layers of necrotic tissue according to Murray and others, however, these microorganisms are quite probably only secondary invaders. Various other microbian agents of intestinal origin are usually demonstrable in the lesions of infectious necrotic enteritis but are not significant as primary etiologic factors.

Symptoms

Infectious necrotic enteritis varies in intensity and morbidity depending upon the susceptibility of the affected swine and the pathogenicity of the *B. suipestifer*. Thus, the disease may be acute or chronic. An acute septicemia caused by the *B. suipestifer* is characterized by a high temperature, inappetence, arched back, frequent urination and blue belly, however, the usual infection results in a subacute or chronic malady. In general it may be stated that the symptoms

of infectious necrotic enteritis are variable, and the intensity of the symptoms manifested is not proportioned to the intensity and extent of the lesions. Hogs apparently in the best of health may reveal lesions indicative of a chronic infectious enteritis on autopsy while swine manifesting the usual symptoms of this disease may show very limited lesions on autopsy. The infection acts rapidly and is highly destructive in some cases but is slow going and rarely fatal in other cases.

This disease may affect only a few animals in a herd or a few animals may be affected at one time, and they either die or recover and others in the same herd become infected, the disease thus ultimately affecting all swine on a given farm. In other instances practically all of the swine show evidence of the disease at the same time. It is important to keep this fact in mind in making a differential diagnosis and to consider them along with the symptoms.

The affected animals are dull and separate themselves from the other swine. The appetite is diminished, although it may not be noted by the caretaker. In some outbreaks the first evidence of the disease noted is dullness. The owners will report that a large percentage of the hogs lack activity and appear dull and depressed. As the disease progresses digestive derangements become more evident and are manifested by irregular appetite and diarrhea. The affected individuals at this state appear unthrifty, have rough coats, and arched backs. The fecal discharges are quite fluid and of variable color, depending upon the feed.

The affected individuals become emaciated, thin and weak and may die of exhaustion or they may ultimately recover. The temperature varies from normal to 105 deg. or 106 deg. F. during the active stage of the disease, but in the later stages it is not unusual to record subnormal temperatures. In uncomplicated cases, no pulmonary disturbances are manifested.

Lesions

The lesions resulting from *B. suipestifer* infection depends upon the acuteness of the attack. In the septicemic type of this malady there is usually a bluish discoloration of the skin on the venter surface of the abdomen. In some cases there is a marked icterus. Hemorrhages are prevalent in all tissues. Lymph glands are tumefied, edematous, congested and hemorrhagic. The spleen is usually engorged with blood and may be very much enlarged. Nephritis and extensive hemorrhage into the kidney occurs.

The lesions in the acute cases of infectious necrotic enteritis consist of a marked congestion and in some instances hemorrhagic inflammation of the mucosa of the large and less frequently of the small intestine and stomach. The lymph glands related to the affected mucosa will be tumefied, edematous, congested and in some cases hemorrhagic.

The chronic type of infectious necrotic enteritis is manifested by emaciation, and rough coat. There is usually an excessive quantity of serum or sero-gelatinous fluid in the peritoneal cavity. The serous covering of the affected portion of the intestine is usually dull and lusterless. The characteristic lesion of chronic infectious necrotic enteritis consists of an inflammation with an accumulated exudate and later necrosis of the intestinal mucosa. In some cases the lesions indicate that the infection begins in the lymphoid tissue (Peyer's patches and solitary follicles) of the intestinal mucosa near the ileo-cecal valve. The lesions may be found in any portion of the digestive tract including the stomach, but are usually more extensive in the intestine.

In the beginning the lymphoid areas become congested and tumefied and later undergo necrosis. In other cases the lesions are apparently not confined to the lymphoid tissue, but invade the mucosa which becomes congested, tumefied and necrotic. When large areas of the mucous membrane become involved, the lesion appears as a diphtheritic inflammation because of the adherent necrotic tissue. In some cases the entire intestinal wall appears thickened and friable, due to the accumulated necrotic tissue. Some cases are observed in which the necrotic tis-

sue has sloughed, leaving the intestinal wall relatively thin and inelastic.

In prolonged cases or the chronic form of this disease the so-called "button ulcer" is of common occurrence. This lesion occurs when the infection is apparently localized in solitary follicles or Peyer's patches and the inflammatory and necrotic processes extend by continuity, the necrotic tissue remaining intact or accumulating as dirty brown masses with raised margins. Microscopically the surface epithelium in the affected areas and the lymphoid tissue are found to be in various stages of degeneration and disintegration. The degenerated and dead cells commingle with the coagulated inflammatory exudate and appear upon the surface as an adherent mass—the "button."

The mesenteric lymph-glands through which the lymph passes from the infected mucosa are tumefied and may be congested and hemorrhagic. In the subacute or chronic cases the central portion of the lymph glands may be necrotic. The peritoneum adjacent to the involved intestine is invariably affected with a subacute or chronic inflammation. The peritoneal inflammation is manifested in the early stages by an excessive outpouring of serous fluids, but as the process continues there is a tendency to organization and limited fibrous proliferation which is prone to produce adhesions.

Differential Diagnosis

B. suipestifer septicemia may be confused with cholera or hemorrhagic septicemia. The outstanding symptoms of suipestifer septicemia, i. e., blue belly, frequent urination, and dark colored urine, combined with the characteristic lesions, consisting of tumefied spleen and nephritis should be sufficient evidence upon which to base the diagnosis.

The acute type of infectious necrotic enteritis may be confused with enteritis resulting from ingestion of some chemical irritant, particularly salt or brine. The differential diagnosis is dependent upon proper interpretation of history, symptoms and lesions. In chemically induced enteritis practically all swine in the lot will be affected whereas in the case of suipestifer enteritis a relatively small percentage of the herd will be affected and invariably at least some chronic cases will occur and indicate the acute malady was due to the same cause.

Diagnosis of the chronic form of this malady requires an autopsy of one or more cadavers. The characteristic lesions upon which judgment is based occur in the intestine and consist of an inflammation in which some of the involved tissue has become necrotic and is adherent to the intestinal mucosa. These lesions when coupled with a definite history of the outbreak and observation of the leading symptoms—irregular appetite, diarrhea, dullness and variable temperature, are usually sufficient evidence upon which to make a positive diagnosis.

Prognosis

The prognosis in all forms of *B. suipestifer* infection should be guarded. The septicemia form of the malady is practically 100% fatal of all affected swine. Fortunately the percentage of swine in a herd affected with this type of the disease is usually small. This condition is frequently responsible for extensive losses of serum producing swine.

The acute enteric form of the malady is highly fatal but as a rule this form of the disease also affects only a small percentage of the herd.

In the chronic form of the disease the percentage of deaths will be relatively small but the loss of condition of the affected animals may produce an extensive economic loss.

Control

Sanitary requirements are frequently ignored by the hog feeder and breeder. Although infectious necrotic enteritis may occur in swine that are maintained, in clean pens and properly housed it is far more prevalent in swine that are kept in mud and filth. There is a tendency for the larger feeders to keep too many hogs in one lot, a fault that is conducive to the rapid spread of any infectious disease. The men who are most successful in swine husbandry watch their herds carefully and at the first

indication of any defect or disease isolate the affected animal. Quarantine is the first principle in controlling the spread of infection and to be most effective isolation should be absolute.

Rigid enforcement of quarantine regulations in the early stages of infectious necrotic enteritis will materially diminish the losses occasioned by this disease. Slop foods of good quality should be provided for affected animals. They should be kept in comfortable quarters and the droppings should be gathered daily, disinfected and properly disposed of. All dead animals should be burned or buried sufficiently deep and limed to destroy infection.

Prevention

The *B. suipestifer* probably does not inhabit the intestine of normal swine; therefore, its presence signifies a carrier or a diseased animal. The organism is eliminated in the fecal discharges, and soils, feed and water are thus contaminated. Pens, lots, sheds and runs that have been occupied by diseased animals should be thoroughly cleaned and disinfected before other animals are placed therein. Since intestinal parasites predispose to infection with the *B. suipestifer* all swine should be periodically "wormed out."

The *B. suipestifer* produces an endotoxin and a bacterin has been successfully used not only in this country, but also in Europe, thus Pfeiler and Kohlstock report the control of *B. suipestifer* infection in swine on infected farms by the use of a *B. suipestifer* vaccine. Hutyra and Marek obtained good results by regulating the hygienic conditions and the injection of phenolized cultures of *B. suipestifer.*

The losses of swine due to *B. suipestifer* infection on a large hog ranch in Nebraska were diminished to a minimum by two inoculations of the suckling pigs with a *B. suipestifer* bacterin. Many instances could be cited of the apparent value of vaccination of swine against this infection. However, in the prevention and control of this malady and any other disease it is evident that due credit should be given to feeding, and sanitation as well as to vaccination. It should also be definitely understood that vaccination with suipestifer bacterin though quite effective as a preventive agent is of little curative value, particularly in the acute enteric or septicemic form of the malady.

Recommendations

1. On farms where there have been losses of swine due to infectious necrotic enteritis new lots should be provided if at all possible. All pigs when about two weeks of age should be vaccinated with a properly prepared *B. suipestifer* bacterin. A second dose of bacterin should be given about the time the pigs are weaned and at the same time it is advisable to administer a reliable vermifuge.

2. In diseased herds all apparently healthy swine should be removed from the diseased swine and placed in lots not recently occupied by swine. If the disease is chronic, vaccinate all swine, both healthy and diseased, with suipestifer bacterin and repeat on the fifth to the seventh day.

A third injection will probably be of value in the diseased lot.

3. In addition to the separation of the diseased from the healthy and vaccination, proper feeding is of importance. All swine should be given a liquid or slop diet preferably of ground oats or barley. If neither of these are available use shorts. The slop should be made thin and alkalined with caustic soda or lye, one pound to twenty gallons of water. Make the slop so thin in the beginning that the swine will get quite hungry between feeds, then gradually increase the feed in the slop, but always keep the hogs hungry. The slop diet should be continued from 7 to 10 days in the healthy lot and in the diseased lot until the swine have practically recovered. Some practitioners believe that the addition of an intestinal antiseptic to the slop is of value. If such an agent is not used in excess it will do no harm and may be of value. Chlorine solution is claimed by some to be almost a specific.

Reliability of the Tuberculin Test

By JOHN R. MOHLER, Washington, D. C.

YOUR Program Committee has invited me to present something today on the subject of the reliability of the tuberculin test. There has been so much material written and distributed on this subject during the last few years that I hesitate to approach the subject, knowing that there is very little new to present in addition to what I have already stated on numerous occasions.

A review of this literature, and a careful study of the developments in connection with the control and eradication of tuberculosis among live stock, cannot help but convince any fair-minded person that the tuberculin test as used in the tuberculosis campaign has been a most reliable and helpful agency. There is no question but what the use of tuberculin has been a most important factor in this activity.

The Bureau of Animal Industry of the United States Department of Agriculture primarily began the studies of the action of tuberculin soon after it was discovered by Robert Koch of Germany in 1890. In fact, the Bureau of Animal Industry began the manufacture of tuberculin in 1893, and the laboratories of the bureau have been producing this product ever since. During the last 10 years great quantities of tuberculin have been necessary for use in the cooperative campaign, making it especially important to have an adequate and reliable supply of tuberculin available at all times. This has been prepared by the bureau, or under Government or State supervision.

Tuberculin, which is prepared by sterilizing, filtering, and concentrating the liquid upon which the tubercle bacilli have been allowed to vegetate, contains no tubercle bacilli, either living or dead. The very nature of the process of the manufacture of tuberculin precludes any possibility of contamination with living or dead tubercle bacilli. The product contains no substance that has any detrimental effect upon a non-tuberculous animal. It does, however, cause what is known as a reaction in tuberculous animals, making it of great value in the detection of tuberculosis in the living animal. Quantities of tuberculin, much larger than those ordinarily used in connection with the diagnosis of tuberculosis, have been injected into cattle by numerous investigators, who have found that it has no detrimental effect whatsoever on healthy animals.

Although tuberculin has been in use for testing cattle for nearly 40 years, and although in this country it is used annually to test more than 10,000,000 cattle for tuberculosis, very few have much conception of what the product really is. The average idea probably is that it is some kind of product derived from tuberculosis germs and therefore that it must of necessity be more or less dangerous or harmful. Despite this erroneous supposition the fact remains, of course, that tuberculin is essentially the clear, sterile, culture filtrate obtained from the growth of tubercle bacilli on a beef broth medium. This broth is essentially nothing but a meat extract, a consomme to which salt and glycerin are added. The tuberculin which we use for test therefore consists of such parts of the broth and glycerin as the germ has not used in making its growth. In addition, the tuberculin contains a small amount of the material derived from the growth of the germs but never the germs themselves.

Many bacteria produce toxins when they are grown artificially on broth in laboratories. These toxins are capable in certain cases (lockjaw, for example), of

* Address by John R. Mohler, Chief of Bureau of Animal Industry, U. S. Department of Agriculture, at the Midwestern States Tuberculosis Eradication Conference, Cedar Rapids, Iowa, April 29, 1930.

causing symptoms of the disease for which the germ itself is responsible. In the case of tuberculin, however, the case is very different. The tuberculosis germ when it grows does not produce any substance which can be called a toxin or poison. The culture filtrates, or tuberculin, are entirely without effect in any reasonably conceivable dose when applied to healthy animals. Not even a suggestion of the lesions or symptoms of tuberculosis can be induced in healthy susceptible animals by the injection of tuberculin.

Perhaps the fear that healthy cattle may be in some way injured by testing with tuberculin is based on the misconception that tuberculin is poisonous. I have just explained that that is not true. However, it is true that animals which are *tuberculous* are affected by tuberculin injections. This specific sensitiveness is such that tuberculous guinea pigs may actually be killed by tuberculin injections in doses which have no effect whatever on healthy guinea pigs. This reaction of course is due to the fact that the tuberculous animal is overly sensitive (hypersensitive). The tuberculous animal is very much like the man who is subject to hay fever. The pollens of the rag weed and other plants may cause a tremendous reaction in the susceptible hay fever patient, whereas for the ordinary normal person such weeds are entirely harmless. It is an analogous condition that exists in connection with tuberculosis and tuberculin. The tuberculous subject is extremely sensitive, whereas the normal individual is affected not at all.

Efficiency as a Diagnostic Agent

You are all familiar with the remarkable progress that has been made in the eradication of animal tuberculosis in this country during the last 12 years in which the cooperative campaign has been in progress. Almost 2,000,000 tuberculous cattle have been removed from the herds in this country as a result of their detection by tuberculin. More than 180,000 herds containing 2,500,000 cattle in the United States are now on the fully accredited herd list, and there are more than 2,000,000 additional herds containing 20,000,000 cattle that have passed one successful tuberculin test. Herds heavily infected with tuberculosis have been freed from the disease in a few years by continued tuberculin testing and the enforcement of proper sanitary measures.

The diagnostic powers of tuberculin are really remarkable when one considers the difficulty that surrounds the detection of many diseases in the living animal. The systematic tuberculin testing of cattle has made it possible to eradicate bovine tuberculosis from large areas in this country. Today there are more than 900 counties, including two entire States, in what is known as the modified accredited area, meaning that the degree of infection of bovine tuberculosis does not exceed one-half of one per cent of all the cattle contained within such areas. Within a very short time all the counties in a third State will be placed in the modified accredited area.

Other evidence of the effectiveness of tuberculosis eradication, based upon the tuberculin test, can be obtained from the records of the Federal Meat Inspection Service. This service, as you know, covers the post-mortem examination of approximately 10,000,000 cattle and 47,000,000 swine each year. There has been a very marked reduction in the amount of tuberculosis found among cattle and swine slaughtered under inspection in the last few years. Additional information on the reliability of the tuberculin test will be found in our Miscellaneous Publication No. 59, issued in October, 1929.

Concerning Some of the Criticisms

One of the frequently used statements of the critics and opponents of the tuberculin test is that it does not detect the badly diseased cow. This is not so except in a small proportion of cases. Re-

tests in herds occasionally disclose advanced cases that did not respond to a previous test. However, physical examination and retesting locates these advanced cases that are occasionally missed.

On the other hand, it is a fact that approximately 10 per cent of all cattle that react to a tuberculin test in connection with the cooperative campaign have been found to be well marked and advanced cases of bovine tuberculosis. This distinctly shows that tuberculin does detect the badly infected tuberculous animal. Of course, as the campaign progresses the old chronic, advanced cases are being eliminated and the percentage of carcasses going to the fertilizer tank is being greatly reduced.

Again, it is stated at times by critics that tuberculin causes the condemnation of the best cows in the herd. It is probably true that many of you have seen some outstanding animals react to a tuberculin test, but in gathering statistics on this subject the bureau found that about 33 per cent of a group of reactors numbering approximately 17,000 head were considered to be below the average in quality. It was also found that about 25 per cent were above the average in quality. These records were obtained chiefly on cattle of the dairy type. Of course, you hear a great deal about these 25 per cent but never a word from our critics about the 33 per cent of reactors below average.

One absolutely erroneous criticism totally unsupported by the facts and manifestly a figment of the imagination that lacks also the background of good horse sense, refers to the appearance of the injected tuberculin in milk following the testing of cows for tuberculosis. As a result of consuming milk from tested cows it is alleged that babies are made seriously ill and men suffer from rheumatism, heart disease, and even sterility. Such a suggestion to anyone who is informed on this subject, is so fantastic as hardly to require discussion. Consider for a moment the amount of tuberculin injected into a cow when she is tested. The dose certainly does not ordinarily exceed 2 or 3 drops (1/10 of a cubic centimenter). Careful laboratory experiments have shown that this amount of tuberculin does not contain more than 1/500 of a grain of total material which may arise from the growth of the tubercle bacillus. So far as I am aware, even the most toxic substances known to us are without any effect in a dose of 1/500 of a grain, so that even if this entire amount of tuberculin were placed in one glass of milk, yet we could not conceive of any effect upon the person who drinks it. But we have no such condition in tuberculin testing. This minute amount of material is injected into the skin. It is certainly absorbed very slowly requiring as a rule more than 48 hours to produce a reaction and there is nothing whatever to indicate that any of it ever reaches the milk supply. If it did, you can readily understand that the amount would be so extremely minute that the health of the consumer could not possibly be affected, even though tuberculin were a virulent poison. I have already stated, however, that tuberculin is not poisonous, but when given to normal guinea pigs by injection or otherwise, in doses 28,000 times greater in proportion to weight than those used for testing cattle, it is without any observable effect whatever.

Returning to the question of toxicity, it can be maintained and proved beyond question that tuberculin, weight for weight, is nothing like so poisonous as common table salt.

However, in order to obtain definite experimental evidence relative to the possible appearance of tuberculin in milk from tested cows we conducted the following investigations: It is well known how susceptible milk is to taking up the flavor of garlic when cattle are turned on pasture in the spring. We have found that within ½ hour after a cow was fed a small quantity of garlic, the flavor and odor of garlic were readily perceptible in

the milk. However, when 30 cc. of undiluted juice from garlic stems (300 times the intradermic dose of tuberculin) were injected under the skin of cows, no taste or odor of garlic could be detected in any of the milk samples which were taken from the udders at 1 to 3 hour intervals over a period of 2 days.

With the view of studying this subject further a highly distinctive aniline dye (methylene blue) was also injected into the tissues of a series of additional cows. A blue solution 40 times the intradermic dose of tuberculin was used. As in the case of the garlic injections, none of the milk samples examined over a 2-day period showed any evidences of abnormal color.

Additional tests were made with samples of milk from cows which were injected with 30 times the average dose of tuberculin. Milk was drawn from their udders at the two regular milking periods after their injection and 5 cubic centimeters inserted into the abdominal cavities of each of a number of tuberculous guinea pigs known as Group A. Other tuberculous guinea pigs of Group B were injected intra-abdominally as controls with the same quantity of untested cows milk and a series of tuberculous guinea pigs of Group C with the usual dose of tuberculin only. The results were clean cut and decisive. All guinea pigs of Group C injected with straight tuberculin either died within 48 hours or developed marked depression with high temperatures. Those of Group B receiving the milk from untested cows remained normal and likewise the guinea pigs of Group A which received milk from recently tuberculin tested cows never missed a meal nor developed any visible abnormal conditions whatever. The experiment is considered to be a very sensitive one and had there been any tuberculin in the tested cows milk, it certainly would have been noted in such overly sensitive animals as tuberculous guinea pigs are known to be when injected with minute quantities of tuberculin. On the other hand I wish to take this occasion to challenge any of our critics to produce a single experiment from an authorized source which would show that the injection of 2 drops of tuberculin (our customary dose) or even 4cc. (rarely used) could result in the elimination of this product in the milk. Furthermore, there is not a reputable medical or veterinary college in this country nor a recognized authority on tuberculosis in the United States who does not teach that bovine tuberculosis is transmissible to our children and whether the percentage is 5 or 45 becomes very immaterial when we discover that your children or my children are being exposed to the disease by drinking infected milk.

Still another frequently heard criticism of some no doubt well-intentioned but misinformed individuals is that the tuberculin test is the cause of contagious abortion among cattle. This statement cannot be substantiated by any line of reasoning or by unbiased observation. Unfortunately, contagious abortion among cattle is a rather widespread disease in the United States at this time. Naturally, any disturbance in the health of a herd of cattle that may follow the tuberculin testing will be attributed to the test by those not in favor of it.

At one of the hearings a few years ago Congressman L. J. Dickinson of your State, Chairman of the Sub-committee on Agricultural Appropriations, requested me to answer the question "Does the tuberculin testing of cattle cause the spread of contagious abortion among the tested cattle?"

I was very glad to be able to answer Congressman Dickinson with a statement to the effect that there was absolutely no evidence to indicate that such was the case. In fact, I referred him to two large and valuable herds of cattle not far from the United States Capitol which have been tuberculin tested semi-annually for years, and in which neither tuberculosis nor contagious abortion exists.

This can be truthfully stated in regard to many other valuable herds of cattle located in all parts of the United States. With the widespread and very extensive activity in connection with the tuberculin testing of cattle in area work, we have had the opportunity of making considerable observations in this connection. I therefore wish to make the unequivocal statement that abortion disease has not been spread by the use of tuberculin or by the application of any of the methods used to control and eradicate bovine tuberculosis.

Alleged Impurities in Tuberculin

You may have heard statements to the effect that tuberculin contains impurities which render it harmful. The efforts of laboratory workers to separate, in perfectly pure condition, the minute amount of material in tuberculin which causes the reaction, have led some, in discussing such work, to refer to impurities in tuberculin. It should be remembered that impurities from the standpoint of a chemist and from that of an ordinary nonscientific individual, are very different things. To the chemist any substance in tuberculin other than the actual precise substance which causes the reaction, would be an impurity. To the ordinary man, however, impurity implies something that reduces the effectiveness of the active material or which actually imparts to the product undesirable or dangerous qualities. Tuberculin, as produced by the Bureau of Animal Industry, contains no impurities when considered from the latter standpoint. It does, however, contain a certain amount of material which is not apparently active in producing the reaction. That inactive material consists of salt, or glycerin, and of any unused portions of the beef extract. The greatest care is taken by producing laboratories to see that tuberculin is pure in the sense that it will produce no effect on normal animals. In our laboratories a large force of trained men is employed, and no tuberculin is ever shipped until it has been subjected to exacting tests for purity.

Concerning Reactors That Do Not Show Visible Lesions of Tuberculosis

It is only natural that some animals responding to this delicate test do not contain lesions of tuberculosis that can be seen under normal conditions. Tuberculosis does not develop spontaneously upon exposure, but the disease develops slowly up to a certain stage, depending, of course, upon the amount of infection introduced into the animal, as well as the virulence of the organisms, and the susceptibility of the individual. During the time when the disease is in the process of development in cattle a reaction will result upon the application of a tuberculin test. An animal that reacts to the test under these conditions is very likely to show no visible lesions upon autopsy, even though the most careful technic is followed.

Further, it may be stated in this connection that in a great majority of the cases of cattle that react to the tuberculin test the lesions are slight, often times being confined to one location. Tuberculosis is found in a very many different parts of the animal body, including many remote places that may be overlooked upon ordinary post-mortem examination. Microscopic examination of numerous specimens examined in laboratories throughout the country have indicated the presence of tuberculosis invisible to the naked eye.

Retesting Reactors

Livestock sanitary officials have sometimes been criticised because of their attitude on appeals concerning the classification of cattle that have given a positive reaction to tuberculin. These criticisms, when honestly made, are based on a lack of information on the part of the individuals from which they originate, who fail to give due consideration to the fact that a highly scientific test is involved. Rules of arbitration or court

technicalities can not limit or affect the result any more than they could affect the action of the planet upon which we live.

The fact that an animal may react only once in a long period of time was definitely decided many years ago. Some years ago the bureau caused to be retested 343 reactors, with the result that 129, or 38 per cent, did not react, 21 of which were generalized cases, and had they been returned to the herds from which they had been removed serious results surely would have followed.

Please do not understand me as asserting that a veterinarian cannot make a mistake. They are only human, and should be regarded only as such. However, it is known that they are most efficient in their aptness in administering the tuberculin test, which fact is established beyond any doubt by a check of the post-mortem reports covering the slaughter of thousands of reactors.

The result of the application of the tuberculin test to a herd of cattle does not show to what extent the reactors are diseased, but, in the operation of any plan that will be successful in the control and eradication of an infectious disease such as tuberculosis, slightly infected animals cannot be left in the herd with safety. This fact makes the operation of the campaign an expensive one. It is not surprising that the people of this country hesitated for many years before launching upon a strenuous and nationwide campaign to stamp out this animal disease.

Now that the campaign has developed to its present stage live stock owners are determined to complete the task. Results everywhere apparent clearly indicate a very hopeful outlook for it, although we must all be prepared to meet reverses and consistently follow the most approved methods in its control and eradication.

With these few remarks, I would like to say in closing that the tuberculin test has stood the test of time. Forty years have elapsed since this product was discovered. It is universally used in the diagnosis of tuberculosis, and, as time goes on, those who are continually observing what is accomplished by its use have more confidence than ever in its dependability. Without this product and its proper application we would not be in a position to offer encouragement in the control and eradication of a disease that had made such inroads upon the live stock of our country before definite and effective plans were perfected for its control and extermination. Furthermore, the confidence which cattle owners have shown in this test is apparent from the fact that we have never been able to keep up with their requests and at the present time over 2 million cattle are on a waiting list to be tuberculin tested.

SUPPOSED POISONING FROM HORSE TAIL

A correspondent of Imogene, Iowa, writes as follows: "I have trouble with cattle losing their calves, also becoming deadly sick and the other day lost a nice cow. Would like to know the cause. We would like to know what the poison hemlock is like. I am sending a few weeds to see if any of them are poisonous. Our young pigs also have the scours. They are fed corn, water and alfalfa. We took the sows off of milk. Could it be this poisonous weed?"

The specimens sent proved to be horse tail, *Equisetum arvense,* water leaf, *Hydrophyllum virginicum,* and Shepherd's purse, *Capsella Bursa-pastoris.* It is likely that the poisoning was due to the horse tail which is a well known poisonous plant and is extremely abundant in many parts of the state and in the northern part of the United States. Animals poisoned by this are excited—there is uncertainty of movement followed by paralysis of the hinder quarters and finally general paralysis. The pulse is exhilarated. The cases may be acute or somewhat prolonged.

L. H. Pammel.

Internal Parasites of the Horse

THE food producing farm animals, including poultry, have come in for so much attention at veterinary meetings and from veterinarians generally, of recent years, that together with the great extension in the use of mechanical power on the farm, these things are apt to make us overlook the great economic importance of the horse in agriculture. Yet the fact remains that there are over 15,000,000 horses and mules at work on farms of this country, and that these animals are far more important as a source of farm power than all the machines. And, while it would be rash to predict what the inventive genius of man may or may not do in the future, certainly at the present time there is no type of mechanical power available that can supplant entirely or to an appreciably greater degree horses and mules as a source of power on the farm in the near future.

It will be generally agreed I think, that under present conditions, the proportionate loss on farms from infectious diseases of horses and mules is much less than that of any other farm animal, and in view of this fact, perhaps it is a little bit surprising to learn that the horse is the most heavily parasitized of all farm animals.

The loss from parasitism in horses and mules is not so easily ascertained as is the loss in other productive farm animals from parasitism or disease. It is a comparatively simple matter to measure the milk production of a large number of healthy cows and of a like number of diseased animals, as for instance those infected with contagious abortion, and ascertain with considerable accuracy the loss due to the infection, and this, as you all know has been done repeatedly. The loss in production due to infection from this one disease being estimated at from $30.00 per cow per year upwards to twice or even more than twice this amount. The average of these estimates, I think, is about $45.00 loss per cow per year from contagious abortion.

It is also a relatively simple matter to ascertain the weight of a number of pigs suffering from ascaris infestation, for example, and an equal number of pigs of the same age and breeding, and kept under the same conditions, but not so infested, and ascertain the loss due to the infestation, and again, as you are well aware, this has been done repeatedly and the loss is very great as everyone knows.

But, farm implements are not equipped with dynomometers. The tractive power required to move a two bottom plow at a given depth in various types of soil under various conditions of moisture is unknown to the farmer; and he has no accurate means of knowing within anything like definite limits, whether a given horse or a team of horses or mules is delivering the power which should be expected of them from the feed consumed. He may recognize a great difference in the ability of two individual animals to perform farm work, but he does not know if the better of the two is working at 100% efficiency, or at what percentage of efficiency of the better animal, the poor animal is working.

And, when we further consider that in the main the attack of parasites on all farm animals is insidious and lacking in the spectacular effect, high temperature, loss of appetite and often speedy death that results from attacks of infectious diseases, it is not to be wondered at that parasites of horses never have been and are now debited with anything like the loss that is chargeable to them. There is a further loss due to parasites, perhaps not proved but very probable, that is never taken into consideration at all. I

* Notes from an address by H. B. Raffensperger, Miles City, Montana, at the Fifth Veterinary Conference of the College of Veterinary Medicine, Ohio State University, March 19-21, 1930.

refer to the loss from infectious diseases to which severe parasitism is a contributing factor. Evidence is not wanting that horses infested with strongylids for example, when they are colts are more subject to shipping fever, strangles and pneumonia and suffer more severely from those diseases years later than do colts that have been reared without parasitic infestations. The contribution that strongylid infestation makes to colic in horses throughout life is well known and has been recognized for many years.

Take the case of bots. The time was when bot infestation was regarded as of little importance in the adult animal, and it is so regarded yet by many horse owners and doubtless by some veterinarians. Yet, there is considerable evidence accumulated to show that a severe infestation of bots may cut down the ability of horses to perform farm work perhaps as much as 50%. I think there can be no question but that such infestation does cut down the ability to work a very considerable amount and thus lessens the production of farm horses and mules, and thus costs the farmer money.

Bot infestation in farm horses is almost universal. On the whole, little is done by anyone to prevent it or remedy it if it has occurred, and this is just one of the numerous examples that might be cited where the veterinary profession is not rendering to agriculture all the needed service of which it is capable.

Parasites in horses apparently are as prevalent in the wide open spaces as they are in the small farms of the Middle West. As before mentioned, the horse is the most heavily parasitized of domestic animals. It is host to over 100 known species.

Gastrophilus (Bots)

There are three species of bots common in horses in Montana and elsewhere. One, the *Gastrophilus intestinalis,* will be found largely inhabiting the cardiac, the white, portion of the stomach. The *Gastrophilus hemorrhoidalis* inhabits the pyloric portion of the stomach and the intestines. The third species, the *Gastrophilus nasalis,* inhabits the pyloric portion of the stomach in great numbers and is particularly crowded around the pyloric orifice.

The eggs of the gastrophilus, the nit fly, as you all know are deposited on the hair of the shoulders and legs and under the maxilla (chin fly) and on the long hair about the muzzle. The larval form develops in these eggs in about six days. After that time, when the eggs are licked off or get into the mouth and are softened by saliva, the larvae emerge and begin their life cycle within the animal. In the case of the chin fly, it is not necessary that the eggs be moistened. This larvae is able to penetrate the egg shell and emerge as a free moving larvae without the aid of moisture.

The three types of larvae as found in the stomach and intestines are readily differentiated with a hand lens. The *G. intestinalis* and *G. hemorrhoidalis* have two rows of spines. The *G. nasalis* has but one row of spines. The *G. hemorrhoidalis* and the *G. intestinalis* are further differentiated by the body segments or somites, there being two bare somites at the posterior end of the *G. intestinalis* and three bare somites in the *G. hemorrhoidalis.*

As mentioned earlier, experimental proof as to just the harm done by the larvae in the stomach and intestines of the horse is not available, but one can scarcely view the vast numbers to be found in stomachs of horses and colts and to note the irritation produced at the point of attachment without coming to the conclusion that they must be harmful and in no small degree, but irrespective of the harm the larvae may do, the adult fly is unquestionably the source of much annoyance to horses and is responsible every season for many runaways and accidents. Since the adult fly can be prevented by the destruction of the larvae, which is easily accomplished, the annoyance of the fly alone amply justifies treatment.

Carbon disulphid, as is well known, is an effective treatment for bots. Hall recommends a dose of 6 drams (24cc.) given in hard gelatin capsules. They are conveniently administered with a balling gun. Many practitioners give larger doses and so far as I know, no harm has been reported from doses up to 10 drams per 1000-pound horse, but of course the proper dose for the destruction of any parasite in the horse or any other animal, is the minimum dose that will accomplish the purpose.

The usual procedure is to gaunt the horse for from 24 to 30 hours before giving the carbon disulphid. The administration of the remedy will be facilitated by allowing the animal to eat a handful of shelled corn just before dosing. This starts the flow of saliva and helps to get the capsule down easily and smoothly. Some have advocated the treatment in November and December. This is desirable of course, because of avoiding the harm that the larvae may do during the winter, but on the other hand, practitioners with considerable experience in treating horses with bots, are sure that not all the bots can be removed by a single treatment of carbon disulphid earlier than the latter half of February and believe that the treatment should be administered during February and March, depending upon the latitude. At this time carbondisulphid is almost 100% effective.

A Nebraska practitioner who has treated many thousands of animals for bots, has stated that when all the animals in a given district are treated in February and March that nit flies are practically unknown in that community the following summer. He further stated that he treated approximately half of the horses on quite a number of farms one season and was able to note a great difference in the work performed by those animals the following spring. Whereas all the horses, the treated and the untreated, went into the spring work in practically the same condition, the treated horses went through the hard labor of getting in the farm crops with but little loss of flesh and with no attacks of colic or other digestive ailments requiring treatment, whereas the untreated horses working right along with them and in many instances in the same teams, rapidly lost flesh as farm horses commonly do when the crops are being put in in the spring, and were subjected to the usual number of attacks of colic. This, of course was not a controlled experiment and doesn't lead to the definite conclusions that we expect of research work, but it is the impression of the practitioner who is a keen observer and represents his experience in the treatment of more than 10,000 animals for this condition in his practice over a period of some six to eight years. It is worthy of being given consideration until it is confirmed or refuted, by carefully controlled experimental work.

But, there is an easier way to control gastrophilus infestation than the treatment of the infested animal. The larvae must remain for a period of at least six days or longer exposed to the conditions obtaining on the outside of the animal. A 2% solution of any of the coal tar disinfectants will kill many of the larvae in the eggs, according to Bishopp. So, if the animal be sponged off twice weekly throughout the egg laying season with a 2% solution of some of the coal tar disinfectants, some of the eggs will be destroyed and will not reach the stage of development where they are infective and the animal, of course, will not become so heavily infested.

Parasites of the Small Intestines

Tape Worms. Two species of tapeworms are common in horses in Montana, the *Anoplocephala magnum* and the *Anoplocephala mamillana.* As in the case of other tapeworms they require an intermediate host. The harmfulness of adult tapeworms of the horse is not known.

Parascarids. This species of round worm, *Parascaris equorum,* is commonly found in colts and horses in Montana. There is

a lung stage of this parasite and probably it does considerable damage to the host. Oil of chenopodium and carbon disulphid are both quite efficient for the removal of parascarids.

Parasites of the Cecum and Large Colon

The cecum and large double colon are reservoirs for different species of round worms. There have been around 60 different species of cyclotomes identified and others not yet named. In addition to these, there are the ulcer producing *Triodontophorus,* the blood sucking strongylids and other genera whose harmful effects on the host have not been fully determined. Any one who has conducted a postmortem examination on a horse must have observed the hundreds of squirming parasites in the cecum and double colon.

Strongylids

We find in Montana horses, the three species of blood sucking strongyles, *Strongylus equinus* (three-toothed strongylus), *S. vulgaris* (one-toothed strongylus), and *S. edentatus* (toothless strongylus). In my observations of the incidence of infestation, they occur in the order named. This may not be true in other parts of the United States. These species of parasites are probably the most harmful of all to the host and are very difficult to control. They are difficult to control because of the larval forms being so resistant to varying temperatures and able to withstand long periods of desiccation. The *Strongylus vulgaris* is commonly found in different stages of development in the blood stream and causes aneurisms and thrombosis. The most common location of these conditions is in the mesenteric arteries.

Recently on a postmortem examination held on an eight-month-old colt, a very marked ulcer was found in the mucosa of the wall of the double colon and from the ulcer, seven parasites were dissected out, which were found to be *Triodontophorus tennicolli.* On the mucous surface of the wall of the colon of this same colt, on examining an area of 10 x 14 inches, 508 oxyurid larvae were counted. There was no doubt but several thousand were on the entire surface. It will be readily seen how the adults can be supplied from this source for the rectal contents. Other genera such as Poteriostomum, and Esophagodontus have been found also in Montana horses. It might be of interest to state that in this same colt 30 *Strongylus vulgaris* were found in an aneurism of the anterior mesenteric artery. These were picked from the eroded walls of the artery, and it was interesting to note that one of the 30 was an adult, four were in last molting stage, the bucal cavities showing the presence of one tooth and in the others, the bucal cavities were not developed.

The Resistance of Strongylid Larvae to Varying Temperatures and Desiccation

The larvae of the blood sucking strongyles will survive the cold winters of Montana as well as the dry summers.

Horse manure containing strongylid larvae was exposed to the weather conditions of Montana for twenty months and were still active. During these exposures through January and February, 1929, the temperature for twenty-six days varied from one degree below zero to thirty-eight degrees below zero, and during July and August of 1929, the temperature range was from 65 degrees F., to 106 degrees F. in the shade. During these two months less than one inch of rain fell. This last winter was not so severely cold but many of the strongylid larvae up to a few days ago were still active. After surviving two winters and one summer they are still apparently going strong.

Some of these larvae were frozen solid in ice and kept at a sub-zero temperature for several days. When thawed out, they were as active as ever. Others were dried and placed in an incubator at 26 degrees C. (78.8 degrees F.) and kept there for four months. They were so dry that they could have been put into a mortar and

ground to an impalpable powder, and yet after 120 days 10% of them were active. All were dead, however, in six months.

I found a corral where the manure had not been removed for seven years. I dug down 16 inches below the surface and right at the soil, dug up manure presumably seven years old. It was full of active larvae.

These larvae leave the manure to some extent and crawl upon the grass, some dry grass and some wet grass. They will remain upon the grass at zero temperature. They stay right there, and if eaten by the horse, the animal becomes infested. They never appear to go into the ground. Soil one-quarter inch below the surface under infested manure was not found to contain active larvae. They are distributed by the wind in the dust that blows everywhere. During the summer season, the windows of the experimental station were thoroughly cleaned and four weeks later the dust on these windows contained numberless active strongylus larvae.

It has been thought that the horses picked up strongylus larvae at the watering holes, but this is not necessary. They may get them from the grass in the vicinity of manure from infested animals, also anywhere that the wind blows and dust settles.

Prevention of Strongylid Infestation

The foregoing account of our experiment with larvae of the strongylus equinus indicates the difficulty, one might almost say the hopelessness, of effectively attacking this parasite during the larval stage. I know of no treatment for the destruction of the larvae except absolute sterilization of the manure, and when we consider the magnitude of that problem not only for horses at pasture that would have to be followed and the manure picked up, but for stable horses, it will be seen that that is not a very practical method of controlling the parasite.

Treatment of Strongylosis

I am not sure that we have any effective treatment for the blood sucking strongylids; however, oil of chenopodium 20cc. in 960cc. of linseed oil is efficient against cyclostomes and parascarids. The destruction of the mature worm would, of course prevent the contamination of the manure and the pasture.

The Accident of Aneurism

It is of interest to note that the greatest harm done by the blood sucking strongylus is the result of an accident, something probably not intended in the parasite's life scheme. When these parasites are taken into the intestines some of them promptly find their way into the blood stream and as stated before, result in aneurisms in various localities, but particularly in the mesenteric arteries. Autopsies on colts in Montana and in Kentucky and many other places, indicate that there are few that reach the age of four and one-half months without beginning to show aneurisms in these arteries. The clots in these aneurisms are literally filled with strongyles in all stages of development from the larva to the fully mature worm. None of these, of course, ever get out of these places or produce any eggs that can be voided by the animal in the usual way, and result in new infestation. In other words, it is an accident pure and simple. It ends for all time the parasites involved and all too frequently, the animal as well.

Colts in which these aneurisms are found even at less than a year old, have suffered irreparable damage. Their hearts are often greatly enlarged as a result of over work. It is inconceivable that such a colt can grow into a horse that will win on the race track or perform to the full a horse's work on the farm. It is easily conceivable that such an animal must go through life handicapped as to usefulness, and as to resistance to infectious disease and other unfavorable conditions.

Caring for the Thoroughbred After the Race

By FELIX J. KOCH, Cincinnati, Ohio

THE Greyhound reached the crest of the Kentucky hills flanking the Ohio River, and permitting of views into that state across. Below, in the valley, lovely Latonia, northmost race-course of the state renowned for its thoroughbreds time immemorial almost, lay. To its one side, immaculate white stables stretched along. We could make out exercise boys here and there, riding steeds worth princes' ransoms, all.

I set out for Latonia in quest of information. I followed the wake of a big winner there. Its groom led the animal to the line of stables, long, rudely-whitewashed structures with roofs sloping out before to supporting posts, they were. Posts were joined by whited horse-rails. Darky 'ostlers, not on duty just then, shot them "craps" among the posts and rails. Others played at banjos; O'-Susanna and Old Black Joe, and other Southern negro songs. Others played poker, told mad tales, or dozed, regardless, in the sunshine; dreaming of lost bets as though won. The place reminds of the Shelby quarters in "Uncle Tom's Cabin."

So the groom brought the winner to before its stable in the series of stalls to such building. Assignment, horse for horse, was made by the superintendent of the track long before. Owners will often apply for stated stables for their horses a full month before the racing season to make certain of stables preferred. There are 10 to 40 stalls to a typical "stable" at a Kentucky race-course today. The number varies with possible need.

In the better-type stables there is always a stall for each horse. Latonia presents the typical sort. Stalls here are a rude four-square, or cubicle, each. They are given, in preparation for the horse's coming, a deep-straw bedding; built up higher in the center than at the two sides. Straw is changed in the stall a minim three times weekly. The owner's grooms attend this, to make sure.

Hay is in a rack in one corner, where the horse may pull it out as he cares. Fresh hay is put in twice daily. At Latonia the hay-rack is always in an angle of the stall's rear corner.

Across from it, and at the rear too, a metal bucket hangs from a screw-eye to rest say three feet off floor. In this is the horse's water; changed three, even four times, the day. Buckets prove cleaner than the best water-troughs would. Attendants must refill,—and so rinse them,—the several times the day through, as they mightn't do, always, with troughs.

The third corner has a feed-box, suspended by another screw-eye. At Latonia the "box" is a round tin tub, much like a home scullage-can. When not in service. custom decrees it be hung outside the stall against the wall. So all concerned know this horse of the owner's string has eaten all it's desired he should. The trainer in charge just will know to be certain it is "keeping up."

Such the stall-home awaiting the victorious racer! Only, brought to it, he is not taken inside,—yet. First, in Kentucky, a racer's horse is sponged carefully. Every wisp of dust, dirt, must be removed. Next, the horse is permitted five or six swallows of water. He is too hot for a drop more.

Next on that, he is given a good bath, —washed completely over with a sponge and luke-warm water. Often a shampoo-soap is used along. Washing is of the entire body. One man holds the horse for this procedure; two others do the

sponging, one at either side. White men or colored are used for the work; it takes five to eight minutes at most. Duly washed the horse is treated to a "rub-rag-rub." Old salt-sacks are reduced to linen rags for that. For this purpose, they cannot be excelled, the trainers state.

Summer or winter, the horse is now covered with a blanket; lighter in summer than winter, of course. Three, four, weights of such cloth may be put on, as the trainer believes best. The horse shall cool off gradually beneath the cover.

Blanketed as should be, the horse is turned over to the exercise-boy; to lead here and there, where he will. Three-quarters of an hour to an hour, as the trainer directs, the animal is led to and fro. Every four or five rounds of the route the horse is given three or four swallows of water. This till he shows he's had enough by refusing to drink.

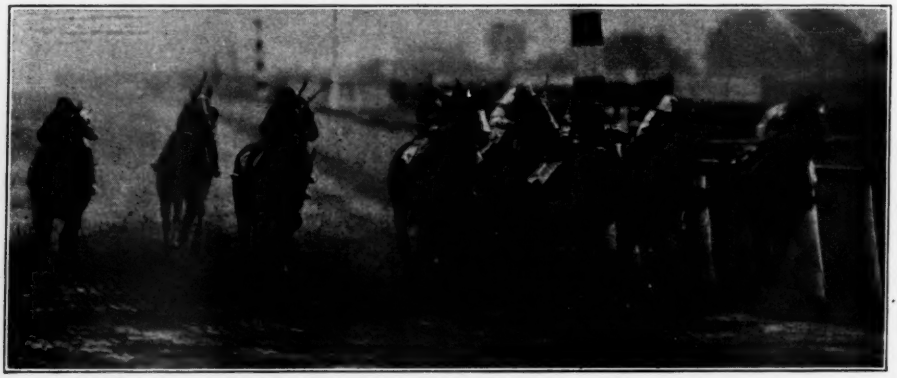
Only then is the horse brought to the stall to stay. Attendants are waiting. They "do up" the horse's body with brush and cloths; especially do they brush him over. Next, they attend any cuts have come; applying wound-lotion where it may be required. Despite the best of care of all concerned, horses engaged in a big race will "hit" each other; minor mishaps will come. Lotions and the like are put on the hurts. If any cuts or bruises are deemed serious the veterinarian is informed.

Doctoring finished, the boy walks the horse a little anew. They just will be certain that he don't cool off too fast; for resting too soon after race. Did he do so, he would emerge stiff and sore.

It's an hour to an hour and a quarter after the race that the horse really enters the stall to rest. Race over at 4:00, it may be 5:15 before he's free.

The fresh hay, the water await. He may do as he will. Usually he turns to the hay. What hay he consumes is replaced, soon as possible, by attendants. There is always to be plenty hay about, —a stall must never be empty of it; the only exception being right after noon feed, on the day the horse is to race, the hay is removed, to keep him from filling up before going out to run.

The stall-door is of two units; upper and lower. They close the lower half to keep wind off the cooling horse. The upper is left open to give him all air he requires. By and by the horse is standing at the door; looking out, eager. He knows it is time for the real evening meal. Always, trainers here maintain a regular hour for this feeding, year on year. Non-race days, supper is at 5:00. After a race, it is later; but only so much so as circumstances require. Four quarts of oats are put in the feed-pail. There is hay about. That is all. Also, the oats'-pail stays in the stall 45 minutes to an hour, no more. This to bring the horse to eating meal-times; eating when he should eat.



Things tidied with removal of the pail, the horse gets his dessert,—his "pie," Kentucky trainers say. Always there is some titbit, carrots; alfalfa, of which the animal's especially fond, and maybe two or three apples. They are fed him by hand by the trainer, the grooms, the owner, when around. Kentuckians tell you there is a psychologic value in this. Horses thrive by attention. Whatever, a thoroughbred comes to know that the treat follows at this point. He stands at the stall door, paws and whinnies until given it. Also, he comes to know from whom to expect the titbit. Let him whistle from whatever direction, and the horse's actions quickly show some good friend 'round.

Horses receive three meals daily in Kentucky, in the race-time. All this very nearly to the same minute daily, unless circumstances prevent. While the horse is at the dessert, the feed-box is removed, as stated. Then the water is changed. The stall-door is then closed for the night.

Turn it ever so cold in the racing-season and nature, the straw, and, if must be, blankets, will do all that need be for the finest horse. Steam-heated stables have been tested. It means sick horses; some deaths.

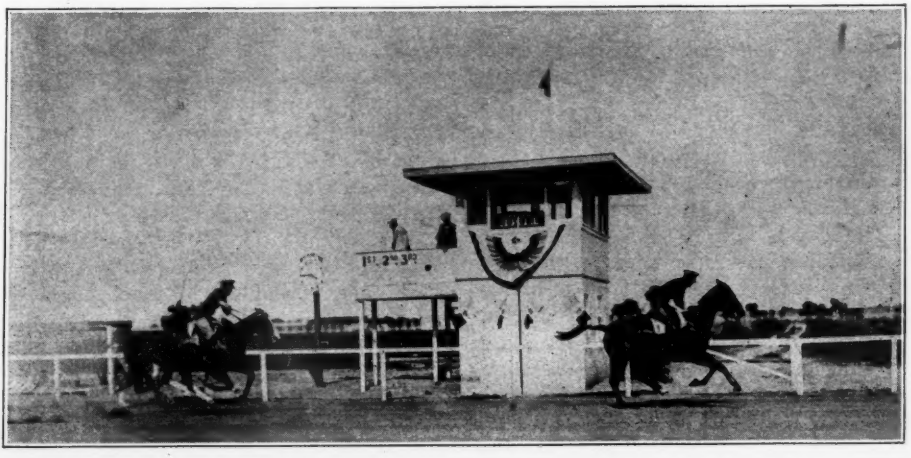
Kentuckians believe in maintaining an abundant guard. There might be some things happen, not altogether to the horse's benefit; things inspired by rival racers, or men betting them on rival steeds.

Just beyond the stall is a room for the foreman of the "crew" for this horse. There is the bed in which he sleeps. He maintains a watch-dog, giving instant warning of strangers. There might be those who'd take advantage of the horse's love of carrots to slip the gentle creature carrot, with "dope" burrowed inside. Some day there may be electric burglar alarms in the stables. That time is not yet.

First day after a race the horse is walked, now without saddle. Second day, there's a saddle put on him, and a "short gallop" is made. The third day he carries a saddle and goes into "long gallop." The fourth day short "breeze-work," or running, succeed. Fifth day there's real running. Then come the sixth day, and all other care just what it should have been, and the thoroughbred itself shows every evidence of wanting to race in turn. Horses seem to inbibe the very spirit of wanting victory, every Kentucky horse-lover attests.

Arrive the fateful sixth day, and the race.

Owner, trainer, foreman, exercise-boys and hostlers, one may guess, will pin what "gold" they can upon him.



VESICULAR STOMATITIS AND FOOT-AND-MOUTH DISEASE

The similarity of the early symptoms of vesicular stomatitis, a disease of horses and cattle, to those of foot-and-mouth disease of cattle and other livestock has occasionally been the cause of alarm to live-stock owners and to some veterinarians. Although there have been no serious outbreaks of vesicular stomatitis in the United States in recent years, it was discovered in several localities during 1929 and caused some stock owners to believe that their animals were affected with the more serious malady. A full description of the disease appears in Department Bulletin 662-D, "Vesicular Stomatitis of Horses and Cattle," issued by the U. S. Department of Agriculture.

FRAUDS IN POULTRY "REMEDIES"

Ten diseases of poultry exist, which, so far as is known, do not yield to treatment with drugs or mixtures of drugs. Consequently, the Food, Drug and Insecticide Administration of the U. S. Department of Agriculture is taking every precaution to keep off the market medicines claimed to effect cures of these diseases, says Dr. H. E. Moskey, veterinarian of the administration. The administration seizes such nostrums whenever they are discovered in interstate or import commerce.

The ten diseases of poultry for which the department regards there are no adequate drug treatments are: Typhoid, cholera, coccidiosis, fowl pest, roup, diphtheria, chicken pox, diarrhea and gapes, and blackhead of turkeys. Some of these can be prevented by proper precautionary methods, but once contracted do not respond to drug treatment.

The Food, Drug and Insecticide Administration has removed from the market hundreds of preparations of this nature and has forced the revision of labels on many others so that the purchaser will not be defrauded. New preparations making extravagant claims are constantly appearing. Many are sold locally and never come under the jurisdiction of the Federal food and drugs act, because they do not enter into interstate commerce.

VITAMINS IN FISH OILS MAY CHEAPEN FARM FEED

Immense quantities of fish oils containing vitamin D are available and farmers can use them profitably in animal feeding. This is announced as the result of recent investigations by the Bureau of Chemistry and Soils of the United States Department of Agriculture and the Bureau of Fisheries of the United States Department of Commerce.

The investigators believe that these oils are obtainable at one-third to one-fourth the present cost of cod-liver oil, which is widely used in stock and chicken feeds because of its high content of vitamin D, now considered essential for the raising of chicks and other young animals as well as for the proper feeding of children. From this information it appears that farmers may obtain a more economical supply of vitamin D with which to supplement the vitamin A content of such feeds as yellow corn and alfalfa.

Pilchard oil, four million gallons of which are produced annually from California sardines, is as rich in vitamin D as cod-liver oil. Tuna oil, equally rich in this vitamin, is less abundant. Salmon oil is about one-half as rich in vitamin D as cod-liver oil, and its vitamin A content is about the same as the poorer grades of cod-liver oil. Because of the great supply the price paid for vitamins A and D in salmon oil is now lower than the price paid for those vitamins in cod-liver oil. The Federal chemists believe that manufacturers can change their methods and improve the vitamin A content of salmon oil. At present the production of salmon oil is slightly less than that of cod-liver oil. The supply, however, can be increased five or sixfold, because millions of pounds of salmon offal from which the oil could be recovered are dumped into Alaskan waters every year.

FORAGE POISONING IN HORSES

I am forwarding by this mail, a sample of sweet clover that is growing mold and also a weed that we know here as horse tail. Would you kindly let me know if either of these would cause botulism in horses?

A number of animals have died suddenly on three different farms within a radius of four miles. I have been told by the owners that the first symptoms noticed was dullness and later labored breathing, when they would live only a short while. Some have been found dead in the stable in the morning.

I had the opportunity of observing and treating two of the cases recently, but these have acted somewhat different from the others. They kept eating and drinking in the usual way, but had a staggering gait and would sometimes fall, but immediately jump up again. They would stand with the head resting on the manger and seemed to be quite nervous, with the vision impaired. The eyes dilated, nervous twitching of head and neck, head held slightly to one side, temperature slightly elevated. These were treated with a physic, intestinal antiseptics and tonics, and as far as I know they are still living.

Any advice you can give me in this connection, will sure be appreciated.—O. M., Man.

Reply: The weed specimen is the common horsetail, *Equisetum arvense.* It is poisonous. The sweet clover is very moldy, quite unfit for feed for horses. It cannot be said with certainty that it would cause either sweet clover disease (hemophilia) or forage poisoning, but both conditions have been caused by such feeds. The equisetum will kill horses if they eat it in quantity. So either of these articles of diet may be responsible for the losses you report, but it is by no means certain that either is responsible. More facts would have to be known to incriminate either.

Of course, mold is frequently the cause of or at least is frequently credited with causing injury to horses; but its action is by no means uniform and it is more than difficult to say that any certain specimen of moldy food will or will not be injurious to horses.

The botulism organism, *Clostridium botulinus,* is not pathogenic for horses. The toxin produced by this organism is fatal to horses, but this toxin is produced only where the organism grows under very special conditions (anaerobic), conditions that I can not conceive of obtaining on the plants you send or on other similar forage.

The history and symptoms that you give fit in quite well with those of Borna's disease, the organisms of which it is believed are always injested with the feed.

Naturally in such case, one thinks of a change of feed as a preventive. Epsom salts on the feed, one to two ounces daily, has been used with apparent success as a preventive in herds of horses where forage poisoning occurred, that is, where one or two animals in a herd had died of forage poisoning and a change of feed was not practical, there was no further loss in these herds when sufficient epsom salts was fed to cause a marked looseness of the bowels.

BOILING MILK IN ALUMINUM DOES NOT DESTROY VITAMIN C

Aluminum cooking utensils have no selective destructive action on the antiscorbutic vitamin of milk, according to the results of experiments carried out at Mellon Institute of Industrial Research, Pittsburgh, Pa. Milk, man's most nearly perfect food, has particular importance in the dietary of the infant and child. There has been a growing tendency to boil milk whenever it is to be used in supplemental feedings, or whenever a supply is of doubtful origin.

In the Mellon Institute experiments milk was boiled lightly for five minutes in aluminum or glass containers. Some destruction of vitamin C occurred in each case as a result of the boiling, but the metallic utensils exerted no greater action than did those of glass. Another interesting observation is that winter milk from ensilage-fed cows is practically as potent in vitamin C as the best summer milk from cows on pasturage.

Diagnosis and Treatment of Some Common Diseases of Sheep*

THE veterinarian who would read up on sheep diseases is limited to a single text, Baker's Sheep Diseases. There is no other book on the subject in the English language that is of any value to a veterinarian. In addition to this, he may find some information on the subject in U. S. Department of Agriculture Farmers' Bulletin No. 1155, and Farmers' Bulletin No. 1330, and a discussion of the Diseases of Feeding Lambs in Colorado Agricultural Experiment Station Bulletin No. 305. Other than these publications, he must depend upon current veterinary periodicals.

Because of our location in a district where 2,000,000 lambs are fed each winter and more than 1,000,000 in the same county in which we are located, we have been forced to learn something of the diseases of feeding lambs.

The common diseases of sheep in this locality may be divided into three groups: (1) shipping diseases; (2) feeding diseases, and (3) parasitic diseases.

Dysentery

Dysentery (para-typhoid) is sometimes seen in feeder lambs shipped into the Fort Collins district from Montana, Wyoming and surrounding states. I would class it as a shipping disease, that is, it is a disease to which the lambs are predisposed by hardships endured in shipping.

An instance is recalled of where shipments of lambs were delayed for nine days at Billings, Montana, owing to floods. Sixty thousand accumulated at that point, and when they finally reached Fort Collins, 30,000 of them were suffering from bloody diarrhea. Since the yards at Billings were not adequate to take care of the thousands of lambs that accumulated there during the interruption of traffic, conditions were very bad. The lots were muddy, and hay was fed on the ground. The loss in this lot was about 2,000. It varied in different shipments from 2% to 16%. The diarrhea is said to have appeared before the sheep left Billings. It was noticeable that the disease affected only lots that were starved 48 hours or more.

Some experiments were undertaken after these sheep reached Fort Collins. An organism was isolated and a culture made. A number of lambs were starved for 48 hours and then fed 50 cc of the culture. All died. A second lot, controls, were starved 48 hours and not fed the culture, and all lived. A third lot was fed 50 cc of this culture but not starved. They lived. So, it appears two factors were involved in producing the dysentery, massive infection, and fasting.

A further experiment showed that lambs that were fed regularly could withstand six times the lethal dose for lambs that were fasted even for only twenty-four hours. After this experiment was completed, it was found that typhoid dysentery of sheep had been described in Germany in 1919, and since in Europe people are not so fastidious about the meat they eat as are Americans, a herd of lambs suffering from para-typhoid dysentery were slaughtered and used for food. Over 1200 cases of food poisoning resulted.

Veterinary practitioners about Fort Collins thought that they obtained good results in the treatment of animals in this outbreak with bismuth subnitrate and tannic acid in neutral oil. The heaviest losses were in crowded pens where no special care was given.

The chief point in prevention is to

*Notes from an address by I. E. Newsom, Fort Collins, Colorado, at the Fifth Veterinary Conference, College of Veterinary Medicine, Ohio State University, March 19-21, 1930.

avoid fasting or to avoid infection. Since the latter perhaps cannot be done where sheep are crowded together in muddy lots, it is important that they be fed regularly.

Hemorrhagic Septicemia

The same association occurs between shipping and a number of other diseases. In other words, the hardships and exposures incidental to shipping, set the stage for a number of organisms destructive to sheep under these conditions, and for this reason the history should be gone into carefully when one is called to see ailing sheep. Too many veterinarians seem to know little if any infection in sheep other than hemorrhagic septicemia, and they are too ready to rely upon vaccination. Though some are inclined to doubt it, I still believe that there is such a disease as hemorrhagic septicemia, and that the use of bacterins is a valuable preventive measure. However, the diagnosis should be made before the sheep are vaccinated rather than the other way round.

Hemorrhagic septicemia when it runs a course of any considerable length is apt to affect the respiratory organs and many cases of pneumonia result as a complication of this disease. I cultured 34 consecutive cases of pneumonia and isolated the hemorrhagic septicemia organism in 32 cases. No diagnosis of hemorrhagic septicemia was made, except the bipolar organism isolated was pathogenic for rabbits.

Some years but little hemorrhagic septicemia is seen among the Colorado feeder lambs, other years there is a great deal of it and the loss is heavy. Many believe that hemorrhagic septicemia organism can be isolated from normal animals, but such has not been my experience. I have made hundreds of examinations of sheep sick and dead of a disease due to overfeeding and never in a single case did I find hemorrhagic septicemia organisms.

It should be emphasized that hemorrhages under the epicardium and under the pleura are not diagnostic of hemorrhagic septicemia.

Sore Mouth

A very common condition among feeder lambs is one that the feeders term sore mouth. It consists of crusts on the lips which are swollen and rigid. Eating is painful and because of this the loss occurs. Few die but affected sheep lose condition from a lack of food. The Bureau of Animal Industry once quarantined for this condition, but do not now. The *Actinomyces necrophorus* can be isolated from these lesions more frequently than any other organism, but I doubt if this is the cause of the condition.

While the death losses, as before stated, are low in this condition, the animals by no means all recover. In a considerable number of cases in certain outbreaks, the disease is prone to spread to the tongue and cheeks and assume the appearance of calf diphtheria. Sometimes large diphtheritis ulcers similar to the lesions on the lips appear in the recticulum and less often in the omasum, abomasum and rumen. Sometimes pneumonia occurs as a complication and in this the lesions found are circumscribed pneumonic areas.

In all lesions, the organisms found are the same as in the lesions found in the lips. There are some things to indicate that the cause of this disease is a filtrable virus. Sore mouth I think, should be classed as a shipping disease. Outbreaks have originated only in sheep that have been shipped recently.

It seems important to treat all cases of sore mouth. The treatment consists in removal of the crusts and the application of iodin. I believe that this is important to prevent the spread of the disease, as well as to hasten recovery of the affected lambs.

Coccidiosis

Coccidiosis in feeder lambs has been seen in the Fort Collins area for a number of years, but never before so serious as during the past year. Ordinarily, the disease shows up a short time after the

animals have been put in the feed lot. A few will show bloody diarrhea which usually clears up after a time, and only occasionally is there a loss.

During the past year there have been nine serious outbreaks of bloody dysentery due to coccidiosis. The condition is easily diagnosed as smears of the bloody fecal discharge show thousands of coccidia. The nine severe outbreaks during the past fall came from different sections. Sheep from several states were included in these shipments. They came over different railroads. There seems to be no common factor in the predisposing cause other than shipment. Twenty-seven per cent of the animals in the lots were infected and 5.4% died.

Coccidiosis when severe, is sudden in onset and the animals die rapidly for a few days. The owner thinks they all are going to die. The treatment used was tannic acid 2 gr., bismuth nitrate 3 gr., neutral oil 1 oz. Two ounces of this mixture was given as the first dose and one ounce daily as long as they scour. Some veterinarians used naphthalin.

It is necessary to separate the sick from the well and to treat individually all the sick animals until they clear up, when they can be put back with the feeders. A purgative may be beneficial except in the weak cases, as this works well in cattle.

Outbreaks of coccidiosis come in waves, mounting rapidly in severity after the first appearance and later subsiding of its own accord. Since veterinarians are not usually called until the outbreak becomes severe, until perhaps it has reached its height, we cannot be sure of the value of isolation and treatment. Perhaps the outbreaks were just ready to subside anyhow.

An effort was made to find the predisposing factor common in the nine outbreaks that occurred last fall, but although the source of each shipment was investigated and the way they were handled enroute, nothing could be discovered to account for the outbreak.

Overfeeding

Among the feeding diseases, the chief loss is due to a condition to which we have never been able to assign any cause other than too much grain. Where animals are run in the corn field it appears after about thirty days when all the weeds and low vegetation has been cleaned up and the sheep are beginning to eat large amounts of corn. When sheep are fed in pens, it appears about the time the sheep are put on full feed.

The condition can be stopped promptly by reducing the amount of grain in the feed and, it can be reproduced just as promptly by supplying more grain. Since lambs must make a rapid gain in the feed lot to make a profit for the feeder, and get on the market in proper condition at the proper weight, at the proper time, this condition is very serious. It first appears in the strongest feeders and the most vigorous lambs in the lot. The symptoms are chiefly cerebral. The head will be drawn back or to one side. In very acute attacks, the animals are sometimes found dead in the morning without any symptoms having been observed the preceding day. Three days after the grain is cut off from the feed, there will be no more losses.

If grain is fed again, beginning gradually, the losses will not appear until heavy feeding is reached, and then they do appear with regularity.

Affected animals show a high percentage of sugar in the urine and a meningitis, but rabbits inoculated with meningeal emulsions remain negative. Sometimes there are large blotchy subserous hemorrhages and such hemorrhages may appear also in the muscles and in the diaphragm. In all our hundreds of examinations of such animals, no organisms of significance have ever been found associated with the condition. It has been suggested it may be braxy (Bradsot), infectious necrotic hepatitis of Australia, but the condition appears to be different from the Australian disease. Ictero-hematuria also has been suggested,

but in Colorado this never occurs except in sheep more than one year old and always in sheep from mountain districts. Lately, however, this disease or a similar one, has been described in New York state. This disease of feeder lambs bears no relation to ictero-hematuria.

Progressive Pneumonia

There is a type of slow going progressive pneumonia seen in sheep, principally in breeding sheep, that is not associated with hemorrhagic septicemia. It is a serious and fatal infection. I believe it best to kill affected animals as fast as they are discovered and destroy the carcasses.

Stercoremia

Preparturient paresis, pregnant disease, acidosis, stercoremia, etc., is a chronic disease of pregnant ewes. They usually die in about two weeks. The disease may be prevented by cutting down on the diet and forced exercise. When it appears in a flock of ewes, mild saline purges should be administered to the well animals. I have seen no worth while results from treatment. In view of the work of Greig of Edinburgh I have procured a quantity of calcium gluconate and shall try intravenous injections of solutions of that salt at the next opportunity.

Urinary Calculi

There is a certain amount of loss among wethers from a condition that is apt to be overlooked even at autopsy. It is a condition in which there are hundreds of calculi in the bladder and in the urethra. The condition is ordinarily fatal, in fact, unless one is looking for it, it is apt to progress to the point where the bladder is ruptured before it is discovered. Of course, after the rupture, the bladder retracts and remains empty, and may be overlooked, on autopsy, unless on the finding of a large amount of liquid of a uriniferous odor in the abdomen, one examines the bladder particularly to ascertain if it has been ruptured.

There is no way of removing the calculi. They are often packed the full length of the urethra and there may be hundreds of them in the bladder, so if they were removed from the urethra it would quickly fill up again from the bladder.

If the case is discovered in time, the animals should be butchered. Some veterinarians have opened the urethra at the ischial arch and in this way relieved the condition until the animal could be fattened for slaughter.

Rheumatism

During some seasons, one may see a good deal of rheumatism in sheep. Often there is synovitis and sometimes pus in the joints. The condition seldom causes death, but of course, the animal is handicapped in getting about and does poorly in the feed lot.

Parasites

Formerly when there was a great deal of sheep scab and much dipping was done for it, sheep ticks were somewhat rare, but now that sheep scab is well under control and we are not dipping so much, the sheep ticks are increasing in prevalence. Dipping is a satisfactory treatment.

Sixty grain doses of Kamala have been very effective in the removal of tapeworms from lambs. Lambs not infrequently die from tapeworm infestation and not from emaciation either.

Gid, of course, kills some lambs every season. There is no trouble about locating these cysts in the cranium, since the superimposed skull is soft, and may bulge outward.

SYMPTOMS OF ANAPHYLAXIS IN CALVES

I was much interested in an item in the March issue of VETERINARY MEDICINE (page 89) concerning the loss of Holstein calves from anaphylactic shock as I have had a similar experience.

On account of the increased values and the fact that our stock cows were bred to drop calves at an earlier date than formerly I have for the past fifteen years advised my clients to vaccinate their calves twice each year; at grass time,

around May first, and later when weaned, about November first.

May 10, 1929, I vaccinated thirty-five head of Hereford calves ranging in age from two to four months. At eleven a.m. the calves were turned back with their mothers and allowed to return to pasture —a distance of eighty rods.

At six o'clock p. m. three of these calves were found dead in pasture all close to the entrance gate and all in the same position, limbs and head extended as in spasm, mouth and nostrils filled with froth. A rather hasty post-mortem examination of one calf made by lantern light revealed nothing but congested lungs.

The three calves were of average weight, none were the smallest in the lot and all were in the pink of condition. The calf posted had a stomach full of milk indicating that he had sucked after being vaccinated.

Am sure that your western readers who annually vaccinate thousands of calves would welcome any information as to the influence of age, dosage, kind of product, feed, care or anything having bearing on these losses.—Kansas.

Reply: The vaccination of 35 apparently healthy calves and the loss of three showing frothy nasal discharge and pulmonary congestion within six hours is quite interesting.

You do not state with what the calves were vaccinated and it is unfortunate that no symptoms were observed. A few similar reports have been received in which bacterins had been used. In two such cases an autogenous bacterin was used. In one of these cases an autogenous bacterin was prepared from a composite sample of milk to be used in treating several cows affected with mastitis. This bacterin, in 5cc doses, administered subcutaneously to large Holstein cows, produced a severe reaction within fifteen minutes in practically every cow injected and the death of one.

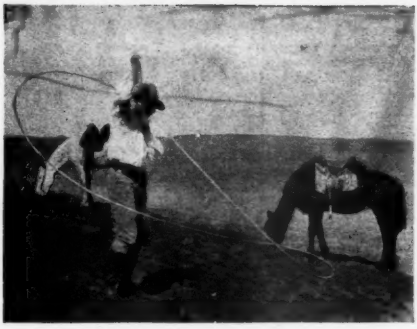
In another instance an autogenous bacterin was prepared from pulmonary lesions in calves. This bacterin was used in from 2cc to 5cc doses, several calves being injected and within an hour after the bacterin was administered there were severe reactions in practically every calf vaccinated and two died.

These two autogenous bacterins did not produce any reaction when given in 1½cc doses to guinea pigs. These guinea pig tests indicate that the reactions in the cows and in the calves was not due to toxins and the brief space of time elapsing between the injection and the occurrence of symptoms eliminates the possibility of bacterial contamination of the bacterin. Thus by elimination the condition occurring in the cows and the calves that were vaccinated with autogenous bacterin was tentatively diagnosed anaphylaxis.

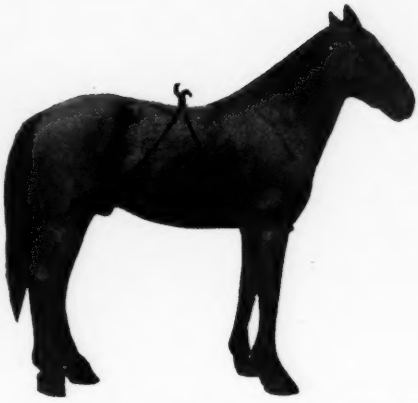
Anaphylaxis is practically the antithesis of immunity; it is a condition of hypersensitiveness. It is an increased or exaggerated susceptibility to a foreign proteid. Anaphylactic reactions vary in different animals and in some cases in the same animals under different conditions.

The classical anaphylactic reaction occurs in animals that are given an initial injection of a foreign proteid and a later injection of the same. By varying the dosage of the initial and second injection variations of susceptibility (anaphylaxis) occur. Anaphylactic reactions may occur in animals in which foreign proteids exist, when injected with relatively small quantities of the same foreign proteid; thus is explained mallein and tuberculin reaction. The anaphylactic reaction in the cows and calves previously referred to the injected animals harbored the same type of foreign proteid that prevailed in the autogenous bacterin.

There is so little known about anaphylaxis that it is difficult to state positively that the loss of the three calves that you have referred to was due to anaphylaxis or some other cause, however, the frothy nasal discharge and pulmonary congestion typify anaphylaxis.



The cowboys of the West have developed "roping" to a high degree of skill. A good trusty horse, a reliable "gat," and a tried and true lariat, constitutes the cattle man's three indispensable utensils for carrying on his business. Continuous practice and natural dexterity have developed some wonderful ropers, who can make a lariat do almost everything but talk. Audiences who have seen Will Rogers will never forget his rope and chewing gum.



Simple method for raising a horse; rope and pulley being all that is required

Clark's Automatic sanitary operating table.

A one-man casting harness. Can also be used for breaking colts

Giving a natural born "puller back" a chance to pull all he wants to, and also to cut his oxygen down to a minimum. This is one condition in horses that cannot be treated with kindness. Once thoroughly broken, the average animal will lose all desire to pull back.

WESTERN RODEOS

Two of the greatest rodeos in the West are held at Cheyenne, Wyoming, and at Pendleton, Oregon, in the autumn of each year. Thousands of people all over the country attend, and for three or four days, the "buckaroo," cow-boy, bronco-buster, and "bull-dogger" reign supreme. Marvelous exhibitions of horsemanship, and the handling of wild steers are given. "Pullin' leather" and "gittin' throwed" is considered a keen disgrace by the cowpuncher, who often has a very high opinion of his ability in his chosen line. Chicago and some other cities have indoor rodeos each winter. They are violently opposed by humane societies.—B.

The Clinical and Epidemiological Aspects of Hysteria of the Dog*

By FREDERICK HOBDAY, London, England,
Principal of the Royal Veterinary College

ALTHOUGH allusions are to be found in accounts by writers on canine ailments which include certain manifestations simulating temporary mania or hysteria, it is only in comparatively recent years, and particularly since the war, that the serious attention of veterinary practitioners and owners of dogs has been drawn to the ailment which is now considered of sufficient importance to be allotted a place for a morning's discussion before the members of the National Veterinary Association at their Annual Congress.

In Great Britain it is most commonly referred to as "Canine Hysteria"; in America it is called "Fright" Disease, the latter name being suggested by the well-marked expression of fear indicated in the eyes and by the general appearance of the affected patients—this being aptly described by many who have seen a number of dogs suddenly disperse and rush off when under the influence of an attack, by the phrase "they seemed as if they had seen a ghost." I doubt if it is so much a "new" disease, as that two factors, viz., the increased numbers of dogs, and the increased attention paid to them nowadays have caused it to be more prominently brought under our notice.

My first large experiences of the disease since the war occurred in the counties of Suffolk and Yorkshire; in the former county in a kennel of Labradors, and in Yorkshire the cases occurred in a kennel of terriers. In the first-named I thought that we had discovered the cause in a mold which was found by microscopical examination in a sample of the biscuit, and at the time we attributed the complete cessation of the attacks mainly to the fact that the dogs were put upon a complete change of dietary, the biscuit supply being changed and a liberal allowance of meat added to the dog's ration. In each instance full doses of sedatives, in the form of the triple bromides of sodium, strontium and ammonium, were prescribed, and exercise was restricted, the animals being kept as quiet as possible for fully three weeks; with the result that the attacks gradually diminished and eventually ceased.

Symptoms

Correlating the symptoms which seem to be tolerably constant in the experience of those who have described outbreaks, we have all been practically unanimous upon the question of the suddenness of the attack, which appears generally without the slightest warning; the dogs, if a pack, suddenly acting as has been described again and again, "as if they had seen a ghost."

Some, if not all (or this may occur with a single dog) scream or howl, and then scatter and rush off in the most frantic manner—sometimes going for miles before they stop, and running into things as if practically blind. In this stage the pupil is usually widely dilated and there is a distinct danger that the animal may, in its frenzy, rush directly into a wall or some other obstruction and be killed; or into a river, or the sea, and be drowned. The barking and howling come on suddenly; and, although it may affect any breed from a thoroughbred to a "Heinz," attacking either sex, it is undoubtedly more common amongst the active and sporting breeds than amongst lap dogs.

* Presented at the 47th Annual Meeting of the National Veterinary Medical Association of Great Britain and Ireland, Aug. 31-Sept. 6, 1929.

In some cases the animal will snap at those who approach or attempt to secure it, so that this point must be borne in mind when trying to secure a runaway. A sudden noise, such as another dog barking within earshot, children playing, the music of a brass band, the passage of an aeroplane, is apt to induce a return of the symptoms.

Sometimes the dog will shake his head and fall down, being apparently dazed or quite unconscious for a few moments; get up, and in a few minutes carry on as if nothing had happened. With those who show these latter symptoms in particular, the contents of the ear may give the clue to the trouble in the forms of parasites or hardened wax; and there are, as you will have read in our veterinary periodicals, practitioners who will go so far as to say that parasites in the ear are *always* to be found, and are the actual cause of *all* cases of the so-called "hysteria."

Epidemiological Aspect

The epidemiological aspect of the disease is of considerable interest; for, although widespread, there is no doubt that it is more prevalent in the country than the town. This is in curious contrast to distemper and the general run of diseases, which usually affect dogs in greater numbers in towns rather than those in the purer air of the country. I have never met with a disease more widespread, and in the statistics which I have been collecting during the past eighteen months, accounts of canine hysteria have come in from the Highlands of Scotland, from isolated districts of Wales, from Ireland, and from almost every part of England.

In the United States of America it has become equally widespread. It has been stated to have had its origin in the Southern States.

In that country hookworm is not uncommon, and this parasite was at one time very largely blamed as the origin of the disease; but this idea is now discarded as incorrect, for very many dogs which have the disease have never had the opportunity for infection with this variety of worm.

In England, too, intestinal parasites have been blamed; but, although their presence in quantity is to be a matter for attention, and they are well known as one of the causes of bowel irritation and epilepsy, they are not the specific cause of hysteria.

The Influence of Dietary

That methods of dietary can form a predisposing factor to this hysteria seems to be a general opinion which is held both by owners and their veterinary advisers, and some have gone so far as to assert that one could produce the disease by feeding on a biscuit dietary alone. This has yet to be tested scientifically and the research which is being conducted will give especial attention to this point.

Certainly it has been very interesting to note that with many veterinary surgeons it is a routine question to ask for particulars regarding dietary, and, if this has largely consisted of materials of a starchy nature, this supply is at once curtailed and a high proportion of meat, or fish, substituted; or, the particular brand of biscuit which is being used is temporarily changed, or substituted by baked bread.

Treatment

The treatment which, from personal experience and from discussion with brother practitioners, I believe to be the best, is to try to keep the patient quiet, in the dark, if possible; and to rectify any palpable source of reflex irritation, such as constipation, or the presence of parasites in the ears; to give a dietary of meat, or fish, and brown bread; to forbid exercise, except such as is absolutely necessary, for a period of about three weeks; and for medicine to administer sedatives such as the triple bromides, or luminol soda, in full doses. Deaths in hysteria cases have, in my experience, been rare, although on several occasions dogs have been destroyed at the request of the owners; but I think that if the circumstances had been convenient for treatment, the majority

of these would have recovered. The same has applied to cases which have become paralyzed in the hind-quarters—the paralysis, if an accompaniment of hysteria only, has usually passed off eventually.

The difficulty has been at times to differentiate, when called in, between true hysteria and epilepsy; or the onset of the nervous form of distemper.

The saline injection treatment as an adjunct to the administration of large doses of sedative, as suggested by Mr. Spicer in a paper read in March last before the Central Veterinary Society, has been followed by some permanent successes—but enough cases have not yet been dealt with to say definitely whether the proportion is greater with the use of this combination than when the sedative is administered alone.

The addition of vitamins, cod liver oil and the use of thyroid have all been tried, but up to the present I am unable to express any definite point as to their specific value.

To those who are making observations upon and investigating the disease, I would recommend a perusal of the papers by Lt.-Col. McCarrison and Professor Mottram in the "British Medical Journal," January 21st, 1928, as they are full of suggestions in connection with the use of ill-balanced rations as a cause of disease, in which they have discussed certain experiences which seem to have some relationship to the production of the disease which we are discussing today.

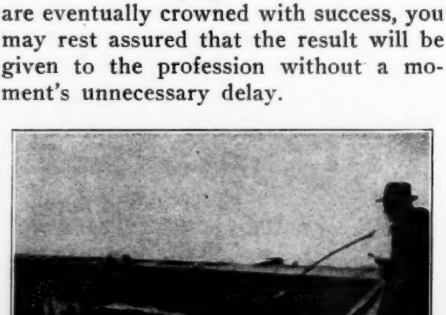
The Question of Contagion

As to whether the disease is contagious or not, opinions vary. Personally I do not at the present moment think it is. It is a question which one is often asked, but until we know more about the actual cause, we can only surmise.

The great importance of this question, however, is shown by the interest which the Government veterinarians of other countries, where it is at present unknown, take in it, from the point of view as to whether there is any likelihood of importing it.

It is certainly a most troublesome disease, and in view of its almost universal spread to all parts of Great Britain, one to which it is necessary that veterinary science shall devote serious attention.

In the brief notes which I have brought in front of you I have only attempted to *introduce* the subject for discussion under the headings which were selected *i. e.*, the Clinical and Epidemiological aspects), for I freely admit that I have as yet no fixed opinion about it. When I accepted the invitation to speak upon the disease, I had hoped that the research which is, by the generosity of a gentleman who does not wish his name to be mentioned, supported by the National Dog Week Council, being made at the College, would have been further advanced, and that we should by now have had something definite to announce; but, except in regard to clinical and epidemiological statistics collected from all parts of the Kingdom, we are only in the early stages. Our handicap with improvised laboratory accommodation and shortage of funds and equipment, has been a very real one, but at last we see daylight; and if our efforts are eventually crowned with success, you may rest assured that the result will be given to the profession without a moment's unnecessary delay.



Racing

Rejuvenation by Grafting Sections of Testicles on an Old Great Dane*

By V. R. PHADKE, Bombay, India
Assistant Principal, Bombay Veterinary College

THE famous rejuvenation expert, Dr. Serge Veronoff, Director of the Department of Experimental Surgery of the College de France, Paris, visited the Bombay Veterinary College on the 10th of December, 1929, and at my earnest request, gave us a practical demonstration of his method of testicular grafting.

One of the professors who owned an old Great Dane was very anxious to get his animal rejuvenated and thus take advantage of the opportunity, and an adult pariah dog was procured to serve the purpose of the donor. The grafting operation was performed by Doctor Veronoff, members of the staff helping him at every stage.

The Great Dane and the pariah dog were placed on separate tables. First the pariah dog was anesthetized. Its scrotum and upper portions of the thighs were shaved and thoroughly washed with soap and water, then washed with alcohol and lastly painted with tincture of iodin and the Great Dane was prepared in the same way. Chloroform was employed for general anesthesia.

The operation on the pariah dog was a short one, consisting merely in the incision of the scrotum and removal of one of the testes through the tunica vaginalis reflexa, the stermatic cord being clamped as for castration. The epididimus was removed and the enucleated testes was kept wrapped up in sterile lint.

After treatment of this animal comprised ligating the spermatic cord with catgut and removing the clamp. The dartos and fascia were sutured with interrupted stitches and lastly the skin wound was sutured with silk. Flexible collodion was painted on the wound and a bandage applied.

Meanwhile the Great Dane was anesthetized and with all due sterile precautions just as in the case of the donor, the scrotum was incised over one of the testes nearly parallel to the median raphe. The skin receded exposing the connective tissue and dartos which were held by a pair of artery forceps on both sides, and an incision made longitudinally exposing the tunica vaginalis, by blunt dissection the testicle enclosed in the tunica vaginalis was exposed, and each lip of the wound was held by artery forceps.

The enucleated testicle (from the pariah dog) was now cut into halves, each half being again divided into two portions in its entire length. The tunica vaginalis was now scarified on each side of the testicle of the Great Dane and a section (1 c.m. in breadth and about 1 c.m. in thickness) of the graft was placed on the medial and another on the lateral side of the testicle, the glandular substance of the graft facing the tunica vaginalis.

Now the extreme ends of the graft and the sides were sutured on to the tunica vaginalis with four interrupted catgut sutures. The lips of the dartos coat forming the cul-de-sac were now brought together and sutured with catgut continuously and lastly the skin of the scrotum was treated similarly with silk suture.

The other testicle was operated upon in a similar manner. The external wounds were then covered with collodion and bandaged.

* Paper read at the sixth All-India Veterinary Conference, December, 1929. Reprinted from the *Indian Veterinary Journal.*

Infectious Pneumonia in Angora Goats

By H. J. MAGENS, Fredericksburg, Texas

DURING the last three years but especially in the last few months we have had to deal consistently with a type of infectious pneumonia in Angora goats which in this section at least had not been in evidence heretofore. We have observed that the disease occurs very often and was most destructive and virulent several weeks or days after the animals had been transported or changed to new pastures, entailing changes in climate, changes in surroundings, feed, grazing, etc., all influences which are more or less debilitating. In a word under conditions under which we often see hemorrhagic septicemia in cattle, sheep and swine.

Symptoms

There seems to be an incubation-period of several days. We found it in most outbreaks to be around 10-18 days. During that time the goats will begin to cough in a dry, hard, hacking and spasmodic form. At that time there is only a slight increase in the frequency of the respirations and in the pulse rate. Later on a slight watery, serous discharge from the nostrils will begin. From then on the appetite will decrease very much, the animals become droopy, listless, in some instances lame, even paralyzed mostly in the hindquarters.

Affected goats stand about at first and have very marked difficulty in getting up. Their gait becomes wobbly. Very marked dyspnea is soon evident. Rales may be heard without any effort; there is a fast, weak, erratic pulse; percussion reveals congestion in lower lobes of lungs. The fleece becomes dry, harsh, unthrifty in appearance. The discharge from nostrils becomes more purulent in character, often with dark reddish brownish streaks in it. The conjunctivae become highly injected, always just in a few cases keratitis is present. In some few instances a purulent discharge from the eyes is evident and the eyes become swollen and are kept closed (See Figure 1, photophobia). In many cases ulcerations of the cornea are present, mostly unilateral. The cough becomes more moist, spasms almost convulsions accompany each fit of coughing. Very marked dyspnea supervenes and the animals remain recumbent most of the time. In the less severe, more chronic cases vesicular pustules appear about the lips and the lower and inner aspects of the nostrils, which will leave in many instances rather large scaly rusty scabs; with crusts and scales often of a dark brown color. Abortions occur, 75% of nannies aborted in one herd.

The mortality rate of kids and goats up to two years of age was 65% in many affected herds. At that stage many cases of a sub-acute type will occur in the kids. They will show few clinical symptoms other than a marked dyspnea and in some instances a persistent diarrhea. The diarrhea is of an offensive odor; it is in most cases seen in somewhat older kids those preferably of stouter constitution. The chevrons seem to be affected last. They generally exhibit a diarrhea of similar type described for the kids.

Differentiation from hemorrhagic septicemia is almost impossible without a laboratory examination. Hemorrhagic septicemia bacterins and aggressins were of no avail as preventives of this condition.

Lesions

Upon autopsy we find in most cases a very extensive gray hepatization of the lungs and an infiltration of the interstitial tissue. We have found in older cases necrotic foci within the lung-tissue, varying much in size. Again we have found walled off sections containing freely flowing yellowish pus and in some instances containing cheesy material some gritty when cut. Caverns were found as well. A cross-section of the lung will again show gray discolorations and hepatization, the tissue being spongy and doughy and not in any state of collapse. Emphysema is present. Fluid, amber-colored, is present and due to gravity

in the lower section of lobes. The heart is flabby, infiltrated, and in some cases exhibiting small petechia and greyish deposits similar to those found in hemorrhagic septicemia. The apex of the heart is often edematous, infiltrated and of grayish color.

Treatment

Due to the severity of these outbreaks and the economic losses entailed, measures to stop them had to be found. Laboratory examinations were insisted upon in all instances. We are indeed very much indebted to the persistent and untiring efforts of Dr. J. D. Ray who examined our specimens and

Fig. 1. Showing market swelling of the eye and purulent discharge.

isolated an organism resembling the Priess-Nocard bacillus. Autogenous bacterins were made. Our procedure was as follows:

Segregate all clinical cases at once. Treat all animals at once with mixed bacterins of ovine and caprine origin (standard dose). Keep sharp watch for all clinical cases developing after treatment. Institute treatment at once for animals showing clinical evidence of internal parasites, including those showing a marked diarrhea which later on are given one-fourth ounce doses of tannic acid in capsules, and repeated as needed. The second day after initial vaccination we commenced to give all clinical cases small, gradually increasing doses of autogenous bacterins until recovery was evident. The best of food was supplied to all animals during treatment. Cases of Anaphylaxis occur frequently and are very severe and often fatal. Insist in all cases upon the burning of carcasses, disinfection of water and feed troughs, etc.

Fig. 2. Showing clinical symptoms of minor degree but marked diarrhea (recovered).

MALIGNANT EDEMA IN A COW?

After a storm this grade holstein cow went off her feed, and the case was diagnosed as indigestion, for which she was treated and in a few days appeared to be all right.

About two weeks from the first time I saw her she developed a soft edematous swelling around the throat and submaxillary space. The temperature went a degree above normal.

Debility was diagnosed and she was given iodid of potash, but the swelling instead of decreasing, increased and extended down the neck to between the forelegs.

Beyond a little difficulty in walking the swelling did not seem to interfere with her as she continued to eat well.

Setons were placed in the swelling in the sternum and an enormous amount of clear straw colored serum escaped for days, and yet the swelling got bigger and bigger. She was then placed on arsenic, iron and Fowler's solution, but she gradually got weaker and died.

St. Kitts, B. W. I. E. F. Jardine.

Acute Indigestion in Calves

By J. F. DE VINE, Goshen, New York

THERE is a disastrous ailment of young calves often seen in pure-bred herds of the Channel Island breeds, an ailment which for want of a better name, I have styled acute indigestion.

Possibly it might rightly by styled reflex epilepsy, since if we were to ignore the postmortem findings the symptoms are referable more to the central nervous system than to the digestive tract. I have never heard this condition discussed in veterinary circles, neither have I seen it described in veterinary literature by others. An analagous condition in infants is called acute indigestion by medical writers.

History and Symptoms

A well nourished calf, perhaps one of the finest and sleekest in the herd, varying in age from one week to three months, will suddenly refuse part or all of its milk, stand around or lie about stupid and listless for a few minutes to a few hours, either gradually or suddenly developing brain symptoms, standing with its head pressed against the side of the wall or some hard object, and at any time during the attack it may have a paroxysm of bleating, followed by all the manifestations of epilepsy—lying on its side, stiffening of the muscles, pirouetting of the eyes, champing of the jaws, frothing from the mouth, possibly emissions of feces or urine, in some cases death following in a few minutes. Others finally relax, particularly if the case has received proper treatment early. The cases that relax may or may not be seized with subsequent convulsions. If the convulsions are repeated the termination is usually fatal. If, however, they are warded off, the animal may gradually take an interest in its surroundings, possibly stand up again in a few hours and by careful nursing become normal. But even in the recovered case there is usually more or less lingering of the brain symptoms, resembling immobility in the horse, for a few days to a few weeks. Death usually ensues so rapidly that a veterinarian seldom has an opportunity to treat the case until too late, unless those in charge are familiar with the seriousness of the malady. Where a veterinarian is called immediately when a calf refuses its feed or where an owner or herdsman has had considerable experience with this ailment and is on the watch for it, there is a possibility of saving some of the cases.

Autopsy usually reveals a mass of undigested casein in the calf's stomach, varying in size from one to eight or ten pounds, of the consistency of old, tough cottage cheese. All the rest of the organs are normal so far as can be determined macroscopically.

Treatment

Death usually sets in so rapidly that treatment is of little avail, but if treatment can be begun before the brain symptoms are manifest, progress may be aborted or the convulsions mitigated with a resultant recovery. In fact, in one particularly large herd of Guernseys where this trouble caused the death of many calves, with the assistance of a very capable herdsman, I have been able to save over 50 per cent of the calves attacked, and finally have eliminated the trouble entirely by a properly diluted diet. The treatment that has served me best is full doses of morphin or lobelin sulphate the minute the calf is noticed to be at all abnormal, followed immediately, if the calf can swallow, by a pint of lime water; this is to be followed every half hour with from eight ounces to a pint of warm normal salt solution, depending upon the age of the calf. This is to be repeated from two to half a dozen times, depending upon the case. A high enema consisting of warm water and oil should be forced in with the pump and tube at the very outset and repeated several times during the day.

I have used lobelin sulphate, hypodermically, and chloral per rectum with apparent advantage in some cases, in either warding off or mitigating the severity of the convulsions.

Treatment is best applied in the form of prevention.

Prevention

This acute trouble has long been recognized among breeders of the Channel Isles breeds; as a matter of fact there have always been individual cows in the breeds where the solid content of the milk is so unusually high, that more or less trouble has been experienced in raising their offspring on the dam's milk. This trouble has sometimes been manifest by a diarrhea, the cause of which was attributed to too much fat, which in most cases was true, since butterfat, when in excess of the amount which can be digested and assimilated, has a similarity to other oils and fats, acting as a cathartic.

As the knowledge of chemistry of milk increased, experts advised the dilution of the whole milk with skim milk as a remedy for this condition. This sometimes worked satisfactorily, providing the amount fed so diluted was not in excess of what the calf could properly and wholly digest. With the increase of the breeding and selection of high-testing dams or families, mated with sires of high-testing families, producing in turn more regularly high-testing dams, which are so desirable for large official records, acute indigestion became more prevalent, and to get in close touch with a large herd of Guernseys or Jerseys and inquire into their calf trouble usually meant that one would hear of an occasional death from this so-styled "peculiar and uncontrollable ailment."

In searching about to find relief, animal husbandmen and others, advised as a remedy that which seemed to help in a measure, in controlling the diarrhea, i. e., the dilution of the whole milk with skim milk and giving less of it.

While I was attending a Guernsey breeders' meeting a few years ago, a remedy for this ailment was asked for by a breeder, who had lost several calves. A professor of animal industry from one of the state colleges who was addressing the meeting, repeated the advice of diluting the milk with skim milk, making no mention of a lesser amount. I could not refrain from telling him that he was dispensing bad advice. This is obvious if we stop to consider the nature of the complaint and the composition of the milk.

We must first get it clear in our minds that the trouble in these cases is due to lack of digestion of casein rather than lack of digestion of fat. Fortunately, the lack of digestion of fat is usually manifested by a diarrhea, which to an intelligent calf-feeder sounds the warning that the calf is getting too much feed.

Secondly, we must recognize that the milk of all high-testing cows is not only high in fat but is also high in solids, not fat, which of course includes the proteids. For instance, if we should have a Holstein milk testing say 3 per cent fat, we should probably have total solids of about 11.5 per cent; whereas if we take a Guernsey or Jersey milk testing 6 per cent we usually have about 16 per cent total solids. If we separate the fat from such milk we still have a milk heavy in solids, but if we take a 6 per cent milk and dilute it with skim milk we have a milk higher in solids than the original milk and of a kind of solids that taxes the digestive tract the most. To illustrate, if we should take two pounds of whole 6 per cent milk having a solid content of about 16 per cent and add say a half pound of skim milk, as is recommended by those advocating this method, we should then have a milk with total solids of about 16.2 per cent, but only 4.8 fat.

It is rather strange how the fat of the Channel Island breeds has been charged with making its milk less digestible for infants notwithstanding that if you consult the works of authorities on the home modification of cow's milk for infant feeding, invariably the directions begin something like this: "After standing on ice, etc., take off the upper part 'top milk' of a quart bottle of fresh cow's milk so much (depending on the age of the infant) adding milk sugar, filtered or boiled water, lime, water, barley water, etc."

If we ask physicians why they do not use whole milk, they quite likely will say it is because the milk is "too rich." Ask them what they mean by "too rich," and the answer probably will be "too much fat," and

still the ration just cited contains much more fat and less other solids than the original milk.

Notwithstanding that butterfat from a healthy cow and produced by cleanly methods is usually one of the most easily digested elements of food for infants, still it has been and is today accused of being the indigestible content of milk.

This is equally so with calf feeding. Some experienced calf-feeders ignore entirely the casein content of the milk in attempting to correct digestive troubles.

For example I was called to see a valuable Guernsey calf about three weeks old that had been suffering from indigestion and constipation for about two weeks. He had received all kinds and combinations of oils, cathartics and skim milk and still was literally starving to death. When we diluted some whole milk with plain warm water and added some 20 per cent cream, increasing daily the amount of cream necessary to regulate the bowel movements, in five days the calf was quite bright and hungry and soon became fat, sleek and strong.

The remedy for the prevention of acute indigestion is rather simple and convenient, i. e., the removal of the calf from its dam in from twenty-four to forty-eight hours after birth and the dilution of the dam's milk with boiled water—one part of warm water to two parts of whole milk. This is an easy and satisfactory formula. In this way the customary number of pounds may be fed at each feeding. We are simply doing to the milk of high solids what nature does through the Holstein to the Holstein milk. There is still the proper proportion of solids but in greater dilution, and the only function yet ascribed to the water content of milk is that it acts as a dilutant and furnishes bulk, holding the other contents in solution and making them more digestible. It seems quite clear to all that the holding in solution of the solid content of the milk has its advantages since nature so arranged it, but some question the advantage of bulk. Such reasoning can be controverted, since experience has taught us that the bovine not only in early life but in adult life thrives best when the concentrates are mixed, or diluted, so to speak, with large amounts of succulence and roughage.

By way of clinching the argument against dilution with skim milk, it is common knowledge that acute indigestion is more common among calves that are being fed liberally on skim milk than among those fed on whole milk and therefore the addition of skim milk to correct this trouble would be on the theory of *similia similibus curantur*, and if practiced in strictly homeopathic doses I fear the calf would soon decide that life was not worth living.

A NEW INSTRUMENT OF MERIT

I purchased an Eveready Serum Pump about twenty days ago, and I have used it on six or seven herds of hogs in that time. I would not part with it if I could not obtain another one.

It is simple to operate, easy to take care of, and to simply unscrew the air valve and show that there is no possible chance for contamination of the serum by dust in the air, sure makes a favorable impression on clients. Many of them say without hesitation, it is the most wonderful instrument yet devised to inject serum. I think it will also discourage lay vaccination, as no layman will be likely to equip himself with that kind of an instrument for his work.

All parts are interchangeable, the valves are easy to get at. I have had it all apart, and put it together again without any difficulty. There is nothing to wear out other than what wears out in an ordinary syringe, and contrary to what one might at first think it is not clumsy, but is very well balanced when a full bottle of serum is used. With a little practice, one can become very expert with it.

Riverton, Iowa. B. H. Brooks.

Autogenous bacterin has a marked curative affect in severe cases of bovine mastitis and is efficacious as a prophylactic measure when administered every three months according to the findings of Brigham, McAlpine and Anderson in Storrs (Conn.) Agricultural Experiment Station Bulletin No. 158.

A Lame Mule

By S. L. STEWART, Olathe, Kansas

AN EXTRA good mule began carrying her left front leg, and it also being badly swollen, the owner became alarmed about blood-poison and called me.

Upon arrival I found the mule distressed, high temperature, very lame holding the foot up while walking, the leg swollen to the body and hot.

The history given, was that while hauling feed some four weeks prior to this day the mule slipped on the ice and sprained her leg, and had been quite lame ever since.

The trouble was diagnosed as a nail prick or similar injury in the foot.

While obtaining the history I proceeded to obtain the hoof-knives, hoof-lesters, syringe, bandages, cotton, iodin and etc., from the car. The usual procedure was followed out, locating the trouble at the central part of the frog. When the hoof knife was applied to cut the frog an abscess above the heels broke discharging an unusually large amount of pus. Cutting deep into the frog a six penny nail was found imbedded full length in the foot, extending in the direction of the abscess, missing the third phalangeal articulation and the bursa podotrochlearis, the nail evidently following the course of the flexor tendons. After the foot and abscess was properly cared for and dressed, the owner thought the farm foreman could care for the mule.

On the fourth day I was called again to see the mule, and upon examination I found that pus infection had passed upward under the skin and had sloughed through in two places above the fetlock joint. Infection had also passed forward from the original abscess around the lateral side of the digital region and a large cavity filled with pus extended to in front and above the coronary band.

It was a sorry sight, and I advised destruction of the mule. The owner said "give the mule a chance to live regardless of expense, the mule is a four year old and is worth $250.00."

Upon the owner's insistence I proceeded to treat the mule. First by cutting large openings in the abscess pockets above the fetlock joint. Then a large "V" shaped opening in front of the digit above the coronary band, syringing the places well with denatured alcohol. The alcohol would pass freely from the top opening out through all the other openings and the original injury at the bottom of the foot. But nevertheless it was a sorry case to think of recovering. After a thorough cleansing with denatured alcohol, the foot, digit, fetlock joint and about one-half of the metacarpas was dressed with plenty of absorbent cotton and two gauze bandages. The dressing all saturated with alcohol. Then instructing the owner to thoroughly saturate the dressing with the same solution in twelve hours. To my surprise in twenty-four hours the swelling in the leg was much reduced, the foot resting on the floor, the mule's temperature had dropped to nearly normal, the animal did not show symptoms of much distress and was eating hay. In three days she was standing some weight on that foot, and in ten days was walking on it, but of course, lame. This same method of treatment was repeated every day for fourteen days when the dressing was left off and I discharged the case as the mule was only slightly lame and doing nicely.

The above treatment may not produce the desired results in other cases but it worked wonders in this one. I should add here that the denatured alcohol (pink) for external use was bought from a reliable veterinary supply house and was not anti-freeze alcohol from a garage.

Reviews and Abstracts

Foot-and-Mouth Disease[1]

Foot-and-mouth disease has prevailed in Europe for a great many years and has occasioned tremendous economic losses there. In most countries of continental Europe the plague has existed so long and has gained such a foothold that it is economically impossible to fight it with American methods of slaughter and disinfection, for to do so would be to kill a large percentage of the livestock of those countries. This likewise holds true in the case of many countries of South America and the Orient. In consequence, little or no progress toward eradication has been made.

Foot-and-mouth disease has appeared in the United States on nine occasions—1870, 1880, 1884, 1902, 1908, 1914, 1924 (twice), and 1929.

The first outbreak in 1870 was introduced by way of Canada, where the infection was brought by an importation of cattle from Scotland. It spread into the New England States and New York and appears to have been arrested within a few months. About 1880 there were two or three lots of animals brought to the United States affected with the disease, but there was no extension from the animals originally affected.

In 1884 there was a small outbreak at Portland, Me., caused by imported cattle, and the disease spread to a few herds outside of the quarantine station. Owing to the small number of animals affected and the limited area of territory covered by the disease, it was easily brought under control.

In November, 1902, the disease was discovered in Massachusetts and Rhode Island and spread to New Hampshire and Vermont. It was eradicated in about six months at a cost of about $350,000.

The next appearance of foot-and-mouth disease was in 1908 near Danville, Pennsylvania. The disease was found in Michigan, New York, Pennsylvania and Maryland and was traced to small pox vaccine virus of Japanese origin. The disease was eliminated at a cost of about $400,000.

The sixth outbreak of foot-and-mouth disease was discovered in October, 1914. It spread to 22 states and required nineteen months to eradicate and cost about $9,000,000.

The next outbreak occurred in California in 1924, requiring more than a year to eradicate and costing about $4,000,000. An outbreak in Texas in the same year cost $1,000,000 to eradicate.

The ninth and latest outbreak of foot-and-mouth disease in this country occurred in Southern California in 1929. It cost about $110,000 to eradicate it.

[1] Mohler, John R.; Foot-and-Mouth Disease; U. S. Department of Agriculture, Farmers' Bulletin No. 666.

Contagious Abortion Germs Affects Fowl

Recent experiments at the Michigan State College Agricultural Experiment Station[2] has shown that the Br. abortus produces a serious infection in fowl. Experiments extending over a period of two years in which a total of 48 birds were exposed artificially to this germ, produced an infection in nearly all birds.

Infection was produced with equal facility in the experimental birds with the bovine, porcine and caprine types of the organism.

The agglutination test possessed a high degree of accuracy in the fowl except during the last stages of the infection when the birds do not react.

The course of the disease is rather variable. Death may ensue from 18 to 96 days. The birds first show a diarrhea, a paleness about the head, comb, and wattles, and gradually lose weight. The birds become very weak and often show

[2] Emmel, M. W.; Find Abortion Germ Infects Fowls; Michigan State College, Agricultural Experiment Station, *The Quarterly Bulletin*, Vol. XII, No. 1, August, 1929.

paralysis before death. The presence of these symptoms appears to be very constant. Diagnosis is somewhat complicated by the fact that the lesions found in the organs are rather variable.

One of the most important and interesting features in connection with the work with this disease was the finding of natural infection in four flocks. The owners of three of these flocks desired their flocks tested for bacillary white diarrhea because they had fallen off in egg production. A very small percentage reacted to the test for bacillary white diarrhea while an average of 20 per cent reacted to the test for the abortion germ. Three birds suffering from the infection were received for diagnosis from a fourth flock. This flock contained a large number of birds. Thirty had died and 10 were sick, all showing the symptoms described above. Egg production had dropped from 80 per cent to 65 per cent. Sixteen birds from these flocks were studied in the laboratory and found to have the infection.

Although death may not be produced in all cases, this infection is of great economic importance, due to the decreased egg yield from infected flocks. Birds experimentally infected soon went off egg production. Flocks naturally infected had a history of decreased egg yield and birds from these flocks studied in the laboratory all showed inactive ovaries. If recovery does take place, it is very slow and as long as six months may elapse before the bird again becomes productive.

B. suipestifer infection in swine is quite prevalent on farms in the Missouri valley. This infection undoubtedly caused greater losses during the last four months of 1929 and the first two months of 1930, than all other maladies in swine. This infection is usually localized in the digestive tract. However it may become generalized resulting in septicemia. This condition is manifested by a high temperature, inappetence, arched back, frequent urination and blue belly.

Avirulent Vaccine Decreases Cattle Abortion

Giltner,[3] in a recent publication of the Michigan State College Agricultural Experiment Station, reviews the history of their experiments in vaccination of animals for the prevention of abortion and adds data recently developed, as follows:

In March, 1922, Dr. I. Forest Huddleson published, in Technical Bulletin 55, reports on the study of many strains of the abortion bacillus (Bang's bacillus), the cause of infectious abortion of cattle or Bang's disease. One of the strains, isolated from a case of abortion, proved to be avirulent, that is, it would not infect guinea pigs, experimental animals which are very susceptible to this infection. Later, it was proved that this particular strain of the abortion germ would not infect cattle. It would neither cause pregnant cattle to abort nor would it establish itself in the udder or elsewhere in the tissues or organs of the cow. It was then logically attempted to demonstrate that cultures of this organism could be used safely and successfully as a vaccine against infectious abortion.

In March, 1924, Doctor Huddleson published, in Technical Bulletin 65, the results of the use of this vaccine on 118 animals in five herds and 23 animals in the Station abortion experimental herds to the effect that a non-virulent living culture of *Brucella abortus* could be injected subcutaneously into both pregnant and non-pregnant cattle without harmful effects. It was shown also that cattle which had been treated possessed immunity against *Br. abortus* infection.

In March, 1929, Doctor Huddleson published, in Technical Bulletin 98, still further data on the use of this avirulent culture vaccine. The summary of that work follows:

"The results and effects of injecting a non-virulent living *Br. abortus* vaccine in 175 non-reacting breeding cattle in 10 dif-

[3] Giltner, Ward; Avirulent Vaccine Decreases Cattle Abortion; Michigan State College Agricultural Experiment Station, *The Quarterly Bulletin*, Vol. XII, No. 1, August, 1929.

ferent herds have been presented in the foregoing data [in Technical Bulletin No. 98]. In the 10 herds were also 152 untreated animals reacting to the agglutination test.

"During the first year following the vaccine treatment, seven animals, or 4%, of the non-reacting treated animals aborted. Of those observed during a second period, 108 in number, only one, or 0.9%, aborted.

"In the 152 reacting animals, 27, or 17.7%, aborted during the first year of observation and six, or 9.8%, out of 61 during the second year.

"Only five of the treated animals were sold because of breeding trouble, while 38 of the reacting ones were sold for this reason.

"There is no indication that the vaccine caused any harmful effects or reduced the breeding efficiency of the treated animals.

"The breeding data and a few bacteriological data indicate that a high percentage of the animals were protected against *Br. abortus* infection."

After seven years of study of this avirulent culture, bacteriologists at Michigan State College are convinced that safe and effective vaccination against Bang's disease is a hopeful possibility that may yet be made practicable.

If, after careful consideration of all the factors concerned, a herd appears favorable for the purposes of a demonstration of the value of the avirulent vaccine, it will be taken on as an experimental herd. On the basis of the agglutination test, the non-infected animals will be determined and these will be divided into two groups, one of which will be vaccinated with avirulent culture while the other group will be left untreated as controls. It is planned that these herds will be kept under observation for a number of years and constant bacteriological and serological checks will be made on all the animals accurately to determine their condition with respect to infection and immunity. The work on the herds will entail no expense or great inconvenience to the owner or danger to the treated cattle.

The Physiology of Milk Fever[4]

The normal process of lactation alone appears to deplete the blood of 25.5 per cent of its inorganic phosphates as compared with the dry cow. There is also a depletion of the acid soluble phosphorus to the extent of 14.5 per cent. The calcium content of the blood is not affected by lactation except temporarily at its onset; the amount was found to be the

The coincidence of recovery with the return of the phosphates to normal after udder inflation, while the calcium is still subnormal in amount, suggests a greater relative importance in getting the phosphate metabolism re-established first possibly in connection with its buffer influence in the blood. Although the calcium lags behind, its gradually increasing amount probably exerts a reinforcing effect and maintains the gains that have been made. It is difficult to explain the early recoveries on the basis of a supply of blood calcium that is still abnormally deficient.

In the foregoing, the author's conclusion differs from that of Greig, who regards the depletion of the calcium store in the blood as the cause of milk fever and the rise in calcium content of the blood following inflation as being responsible for the recovery.

Some allowance perhaps should be made for partiality of each. Greig was the first to point out the poverty of the blood in calcium in milk fever, and Fish the first to report the phosphate poverty.

It should be noted, however, that in reaching his conclusion that restoring phosphate to the blood is more important than restoring calcium in the treatment of milk fever, that Fish disregards the findings of Greig that the normal amount of calcium in the blood is not necessary

[4] Fish, Pierre, A.; The Physiology of Milk Fever III, the Blood Phosphates and Calcium; *Cornell Veterinarian*, Vol. XIX, No. 2.

either for the prevention of or recovery from milk fever, but that a calcium content in the blood of approximately two-thirds of the normal amount is sufficient for prevention or recovery, and that this is the point in calcium restoration at which the animal recovers. Nor could Fish have taken into consideration the more recent reports of Dryerre and Greig, Stinson and Muir, in which typical attacks of milk fever are stated to have recovered as promptly and as satisfactorily from intravenous injections of calcium gluconate as they do from udder inflation.

With the data available, it seems the impartial observer must regard the question as to whether the depletion of calcium or the depletion of phosphates is the more important in bringing about the onset of milk fever as being unanswered, and the same is true with respect to the restoration of these elements in the recovery. Until it is shown that the intravenous injection of calcium gluconate in some way increases also the phosphate content of the blood, it appears that Greig has the better of the argument and that hypocalcemia is of more importance in bringing about the onset of milk fever than is hypophosphatemia.

Abnormal Flavors of Milk[5]

Abnormal flavors of milk may be placed into two classes:

1. Those that are present when the milk is drawn.
2. Those that develop in milk after it is drawn.

The feed of the cow is an important factor in producing abnormal flavors in group 1. Some of the flavors caused by feeds are desirable, as the peculiar flavor produced from eating silage and the "June flavor" of butter in early spring when the grass is luscious. Other flavors, as that caused by the wild onion, by the rag weed, turnips, pumpkins, rape, cabbage, etc., are objectionable, to many. The remedy is to keep the cattle off the feed for a few hours before milking time.

The condition of the cow aside from her feed, may cause abnormal flavors in the milk, as may mastitis, metritis and other febrile diseases.

The flavors coming under class 2, are those absorbed and those produced by bacteria. Milk readily absorbs barn odors and flavors, fruit and vegetable flavors and particularly, drug and chemical flavors. The obvious remedy is not to store milk in the presence of such odors. The cresylec acid odors of some fly-sprays and many disinfectants are readily absorbed by milk and are very objectionable.

The flavors usually classed as barny, soapy, malt, bitter, fishy, unclean, fruity, yeasty and moldy, are due to the action of bacteria of the peptonizing and liquifying groups. Strict cleanliness, sterilization of utensils and holding the milk at low temperatures are the methods of prevention of these flavors.

Common Lesions of the Arteries in Cattle[6]

The common lesions found in the arteries of cattle are described as:

1. Intimal steatosis—a deposition of fat-droplets in the intima around and further into the elastic fibers, followed sometimes by

2. Calcification of the intima, by deposition of lime granules in the disposition analogous to that of the fat-droplets, followed by confluence of the granules and building up of a calcerious disc.

3. Longitudinal wrinkles of the thoracic aorta, due to a packing together of the fibers of the internal zone of the media.

4. Intimal arteriosclerosis—rare cases of intimal thickening, by connective tissue proliferations with splitting of the

[5] Lucas, P. S.; Many Factors Cause Abnormal Milk Flavors; Michigan State College, Agricultural Experiment Station, *The Quarterly Bulletin*, Vol. XII, No. 1, August, 1929.

[6] Tibirica, Paulo; Arteriosclerose Bovina sua Anatomia Pathologica; *Revista da Sociedade Paulista de Medicina Veterinaria;* Sao Paulo, Brazil; Vol. 1, No. 2, February, 1930.

internal elastic lamella and fat deposition into the intimal cells.

5. Medial calcification—a deposition of lime granules in the muscular fibers and around elastic fibers, followed by confluence of the lime granules and building up of a disc; medial thickening of the renal arterioles, by muscular hypertrophy or more often by muscular hyperplasia.

Discovery of Estrus and Gastrophilus in Brazil[7]

Neither the genus Estrus nor the genus Gastrophilus had yet been recorded in the literature as parasites of sheep and horses imported into the State of Sao Paulo, Brazil. In regard to that country the best paper on the subject is that published by Lutz,[8] which however was not definite as to the prevalence of these parasites in that terrtiory.

The author has recently examined larvae of both E. ovis from sheep and G. nasalis from horses and having sent an inquiry to army veterinarians, could definitely ascertain the presence of these parasites in the State of Sao Paulo, where they seem to be fully acclimated.

Occurrence of Fowl Cholera in Brazil[9]

Hens that had suddenly died in the Institute Biologico poultry house (Moóca, S. Paulo) were examined, there being found little microorganisms with rounded ends like cocci-baccili.

Fifteen cases were thus studied and from the culture of organs and blood there was always isolated a bacterium belonging to the genus Pasteurella.

Normal hens inoculated with 0.5cc of broth cultures of this germ died within 24 hours from septicemia.

The bacterium isolated was, therefore, pathogenic for hens and from the detailed study of its morphological and physiological properties it was possible to identify it with *Pasteurella avicida* Trevisan, etiologic agent of the fowl cholera.

Polymorphism of B. Pyocyaneus[10]

With strains of *Pseudomonas aerugmosa* of bovine origin cultures were made in broth, albuminous medium and agar-pepto-glycerin with a view to producing four races of this organism, namely: A, or pyocyanin-and-fluorescence producer; P, or pyocyanin producer only; F, or green fluorescence producer; and S, or neither fluorescence nor pyocyanin producer.

This germ grows in acid medium without inducing coloration.

Upon addition of various antiseptics such as $K_2Cr_2O_7$ and alcohol to the cultures there appeared long and filamentous forms.

Variation in morphology of this bacillus also occurred under the influence of boric acid, phenol and creosote. Creosote induced growth of colorless pyocyanic bacillus.

HOG CHOLERA IN MARYLAND

Thirty-nine per cent of all outbreaks of cholera reported in Maryland since January 1, have been in garbage feeding plants, while seventy per cent of all hogs involved for the same period, were in these malodorous, get-rich-quick maybe, places.

Two farmers went into a neighboring county and, in good faith, bought a bunch of pigs from a dealer. These pigs were distributed to ten different premises in their own county, with the result that an outbreak of cholera appeared on each place. Only thirty-three swine were involved in the ten cases. To the credit of the farmers who sold the pigs it should be added that they refunded one-half the purchase price to the purchasers of the animals.

[7] Von Ihering, Rodolpho; Varios Cases de Estrus e Gastrophilus no Brazil; *Revista da Sociedade Paulista de Medicina Veterinaria;* Sao Paulo, Brazil; Vol. 1, No. 2, February, 1930.

[8] Lutz, Adolpho; Mem. Inst. O. Cruz; Vol. IX, No. 94, 1917.

[9] Penha, Adolpho; A Cholera das Gallinhas em S. Paulo; *Revista da Sociedade Paulista de Medicina Veterinaria;* Sao Paulo, Brazil; Vol. 1, No. 2, February, 1930.

[10] Neiva, Cicero; Sobre o Polymorphismo do Bacillo Pyocyanico; *Revista da Sociedade Paulista de Medicina Veterinaria;* Sao Paulo; Brizil Vol. 1, No. 2, February, 1930.